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Pulpwood Production in the North-Central Region, 1991

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NOTE: *This report includes all primary products made from reconstituted wood fiber. In addition to wood pulp, this includes particleboard products¹ made from chips, shavings, wafers, flakes, strands, and sawdust. This report presents the production by county of the raw fiber material delivered to mills. Thus, these data report only that portion of the timber harvest used as raw material and do not necessarily reflect the volume of growing stock harvested.*

Pulpwood constitutes more than half the industrial timber products harvested annually in the Lake States (Michigan, Minnesota, and Wisconsin) and is an important product in the Central States (Illinois, Indiana, Iowa, and Missouri).

Current detailed information about pulpwood production² is necessary for intelligent planning and decisionmaking in wood procurement, forest resource management, forest industry development, and scientific studies.

Since 1979, we have included logs, bolts, and wood residue used in manufacturing flake board, wafer board, oriented strand board, and medium density fiberboard in this annual report. Together, these products are called particleboards, and all mills manufacturing these boards will be called particleboard mills

in this paper. Wood used at particleboard mills is identical or nearly identical to wood used at pulp mills; therefore, including this wood in our study provides a more accurate estimate of demand for pulpwood-like material.

Particleboard mills were in their infancy before 1979 and used primarily aspen and wood residue. Therefore, data for these mills do not distort roundwood use trends for other species or preclude comparing 1991 survey results with those of 1978 and previous years.

Pulp and particleboard mills using North Central States timber in 1991 reported their pulpwood receipts³ by species group and county of origin. This report presents the results of the survey, analyzes the data, compares results with those of 1991 or earlier years, and discusses trends in pulpwood production and use.

The Lake States and Central States are discussed separately because the timber types in each area are different, the flow of wood between the areas is nominal, and more detailed data on pulpwood production and receipts in the Central States might reveal the operations of individual mills. This is the 33rd annual report of the pulpwood harvest in Lake States counties and the 32nd annual report of the Central States harvest.

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¹U.S. Forest Products Laboratory, 1974. *Wood handbook: wood as an engineering material*. Agric. Handb. 72. Washington, DC: U.S. Department of Agriculture, Forest Service: 23-27. (Revised)

²Pulpwood production, determined from mill receipts, is the annual volume of pulpwood cut, plus the annual wood residue volume produced by sawmills, veneer mills, etc. used for pulp, particleboard, wafer board, oriented strand board, or medium density fiberboard.

³Pulpwood receipts are the volume of wood received by mills in a specific State or region, regardless of the geographic source.

Several mills purchase their pulpwood based on weight rather than volume. Conversion factors used in the Lake States to convert green tons of pulpwood to standard cord equivalents are shown in the Appendix. Conversion factors used in the Central States are shown in footnote 1 of table 4.

Pulpwood production in Minnesota is completely and accurately shown. However, to prevent disclosure of confidential information about softwood pulpwood use by individual companies, the total quantity of softwood pulpwood imports and exports between Minnesota and Canada is not reported. Thus, some Minnesota softwood shipped to Canada is shown as remaining and used in Minnesota, and receipts of Canadian softwood in Minnesota are understated.

LAKE STATES

Production

- Pulpwood production as a whole increased to 8.6 million cords⁴ in 1991 from 8.4 million cords in 1990, a rise of 2 percent (table 1). Of each cord produced, 92 percent came from roundwood (including chips from roundwood) and 8 percent came from residue⁵ from wood-using plants (fig. 1).
- Principal species harvested were aspen (3.9 million cords), jack pine (722 thousand cords), hard maple (554 thousand cords), and soft maple (474 thousand cords). Other major species furnishing more than 300 thousand cords were balsam fir, red pine, and white birch.
- Hardwoods constituted 76 percent of the total pulpwood production. Pulpwood from hardwood residue increased 83 thousand cords (20 percent) from last year's 417 thousand cords.

⁴All references to cords are in standard cords. A standard cord is 128 cubic feet of wood, bark, and air space.

⁵Residue is the byproduct from sawmills, veneer mills, cooperage mills, and other wood-using mills that is used for pulping and particleboard. Residue includes slabs, edgings, veneer cores, sawdust, woodflour, and chips manufactured from slabs, edgings, and veneer cores.

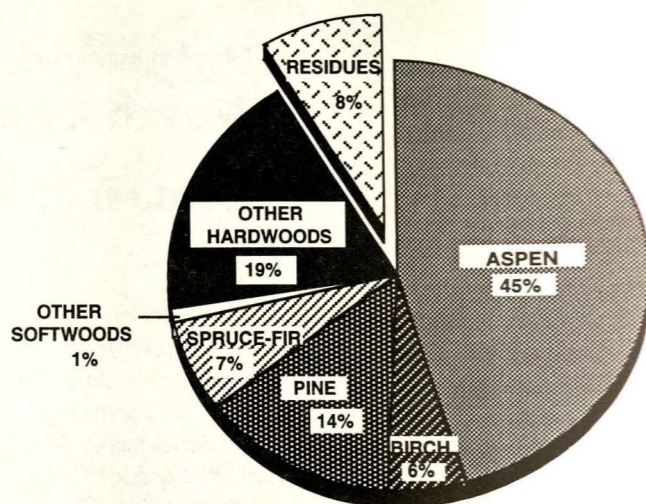


Figure 1.—Lake States pulpwood production by species group, 1991.

- Aspen remained the dominant pulpwood harvested—49 percent of the total.
- Softwood roundwood production reached a new high of 1.88 million cords. Pulpwood production from softwood residue increased to 200 thousand cords, an increase of 26 percent from last year. Increases in jack pine (722 thousand cords), red pine (405 thousand cords), spruce (237 thousand cords), and balsam fir (364 thousand cords) pulpwood production offset losses in cedar, hemlock, and tamarack (fig. 2).
- Whole-tree-chip⁶ (WTC) production, which makes up 6 percent of the total pulpwood production in the Lake States, dropped 1 percent to 512 thousand cords. Aspen WTC production increased 7 thousand cords or 3 percent between 1990 and 1991 (fig. 3). Softwood WTC production increased 10 thousand cords between 1990 and 1991. WTC production in other hardwoods (balsam poplar, maple, ash, and oak) declined 23 thousand cords to 211 thousand cords.

⁶Pulpwood produced from chipping entire trees (all portions of the trees above ground, except the stumps).

Table 1.-Production and imports of pulpwood, Lake States, 1991

(In standard cords,unpeeled)

Species and Destination	Production by States 1/				Imports			
	Michigan	Minnesota	Wisconsin	Regional Total	Other U.S. 2/	Canada	Total imports	Total receipts
Cedar								
Michigan	7,300	--	341	7,641	--	--	--	7,641
Total	7,300	--	341	7,641	--	--	--	7,641
Balsam fir								
Michigan	89,400	--	4,253	93,653	--	--	--	93,653
Minnesota	1,320	194,968	14,966	211,254	--	--	--	211,254
Wisconsin	4,755	--	45,058	49,813	--	--	--	49,813
Exported 3/	7,934	1,780	--	9,714	--	--	--	--
Total	103,409	196,748	64,277	364,434	--	--	--	354,720
Hemlock								
Michigan	44,763	--	2,145	46,908	--	--	--	46,908
Wisconsin	2,637	--	30,750	33,387	--	--	--	33,387
Total	47,400	--	32,895	80,295	--	--	--	80,295
Jack pine								
Michigan	173,303	--	3,853	177,156	--	--	--	177,156
Minnesota	--	134,332	2,169	136,501	--	--	--	136,501
Wisconsin	61,645	5,914	339,464	407,023	--	--	--	407,023
Exported 3/	--	1,779	--	1,779	--	--	--	--
Total	234,948	142,025	345,486	722,459	--	--	--	720,680
Red pine								
Michigan	54,545	--	1,677	56,222	--	--	--	56,222
Minnesota	--	15,764	399	16,163	--	--	--	16,163
Wisconsin	6,331	4,311	321,501	332,143	--	--	1,081	333,224
Total	60,876	20,075	323,577	404,528	--	--	1,081	405,609
White pine								
Michigan	13,223	--	502	13,725	--	--	--	13,725
Minnesota	--	1,432	--	1,432	--	--	--	1,432
Wisconsin	356	--	25,318	25,674	--	--	--	25,674
Total	13,579	1,432	25,820	40,831	--	--	--	40,831
Spruce								
Michigan	14,384	--	673	15,057	--	--	--	15,057
Minnesota	3,553	108,080	1,700	113,333	--	--	--	113,333
Wisconsin	33,716	31,153	30,178	95,047	--	--	--	95,047
Exported 3/	12,106	1,508	--	13,614	--	--	--	--
Total	63,759	140,741	32,551	237,051	--	--	--	223,437
Tamarack								
Michigan	7,097	--	350	7,447	--	--	--	7,447
Minnesota	--	1,672	--	1,672	--	--	--	1,672
Wisconsin	1,451	1,896	5,944	9,291	--	--	--	9,291
Total	8,548	3,568	6,294	18,410	--	--	--	18,410
Total softwood roundwood								
Michigan	404,015	--	13,794	417,809	--	--	--	417,809
Minnesota	4,873	456,248	19,234	480,355	--	--	--	480,355
Wisconsin	110,891	43,274	798,213	952,378	--	--	1,081	953,459
Exported 3/	20,040	5,067	--	25,107	--	--	--	--
Total	539,819	504,589	831,241	1,875,649	--	--	1,081	1,851,623
Residue, softwood								
Michigan	70,895	--	9,385	80,280	--	--	--	80,280
Minnesota	--	27,907	23,248	51,155	--	--	--	51,155
Wisconsin	5,105	1,926	61,077	68,108	88,414	17,403	105,817	173,925
Exported 3/	--	196	--	196	--	--	--	--
Total	76,000	30,029	93,710	199,739	88,414	17,403	105,817	305,360
All softwoods								
Michigan	474,910	--	23,179	498,089	--	--	--	498,089
Minnesota	4,873	484,155	42,482	531,510	--	--	--	531,510
Wisconsin	115,996	45,200	859,290	1,020,486	88,414	17,403	106,898	1,127,384
Exported 3/	20,040	5,263	--	25,303	--	--	--	--
Total	615,819	534,618	924,951	2,075,388	88,414	17,403	106,898	2,156,983

(Table 1 continued on next page)

(Table 1 continued)

Species and Destination	Production by States 1/				Imports			
	Michigan	Minnesota	Wisconsin	Regional Total	Other U.S. 2/	Canada	Total imports	Total receipts
Ash								
Michigan	27,556	--	2,380	29,936	--	--	--	29,936
Wisconsin	952	--	58,998	59,950	--	--	--	59,950
Total	28,508	--	61,378	89,886	--	--	--	89,886
Aspen								
Michigan	975,991	--	50,358	1,026,349	--	--	--	1,026,349
Minnesota	--	1,640,051	16,831	1,656,882	--	27,370	27,370	1,684,252
Wisconsin	117,126	41,480	1,022,686	1,181,292	--	--	--	1,181,292
Exported 3/	--	16,202	--	16,202	--	--	--	--
Total	1,093,117	1,697,733	1,089,875	3,880,725	--	27,370	27,370	3,891,893
Balsam poplar								
Michigan	65,244	--	5,447	70,691	--	--	--	70,691
Minnesota	--	69,512	--	69,512	--	2,464	2,464	71,976
Total	65,244	69,512	5,447	140,203	--	2,464	2,464	142,667
Basswood								
Michigan	33,368	--	3,127	36,495	--	--	--	36,495
Wisconsin	1,755	--	37,370	39,125	--	--	--	39,125
Total	35,123	--	40,497	75,620	--	--	--	75,620
Beech								
Michigan	29,387	--	3,909	33,296	--	--	--	33,296
Wisconsin	2	--	541	543	--	--	--	543
Total	29,389	--	4,450	33,839	--	--	--	33,839
White birch								
Michigan	161,919	--	79,159	241,078	--	--	--	241,078
Minnesota	--	2,888	--	2,888	--	--	--	2,888
Wisconsin	1,433	10,635	173,581	185,649	--	--	--	185,649
Total	163,352	13,523	252,740	429,615	--	--	--	429,615
Yellow birch								
Michigan	19,415	--	1,565	20,980	--	--	--	20,980
Wisconsin	5,656	--	14,135	19,791	--	--	--	19,791
Total	25,071	--	15,700	40,771	--	--	--	40,771
Elm								
Michigan	2,952	--	563	3,515	--	--	--	3,515
Wisconsin	85	--	19,826	19,911	--	--	--	19,911
Total	3,037	--	20,389	23,426	--	--	--	23,426
Hard maple								
Michigan	310,959	--	53,067	364,026	--	--	--	364,026
Wisconsin	31,656	28	158,525	190,209	--	--	--	190,209
Total	342,615	28	211,592	554,235	--	--	--	554,235
Soft maple								
Michigan	275,758	--	27,519	303,277	--	--	--	303,277
Minnesota	--	16,703	7,673	24,376	--	--	--	24,376
Wisconsin	11,249	3,744	131,174	146,167	--	--	--	146,167
Total	287,007	20,447	166,366	473,820	--	--	--	473,820
Red oak								
Michigan	81,848	--	2,703	84,551	--	--	--	84,551
Wisconsin	1,966	--	51,567	53,533	--	--	--	53,533
Total	83,814	--	54,270	138,084	--	--	--	138,084
White oak								
Michigan	41,651	--	--	41,651	--	--	--	41,651
Wisconsin	294	--	15,629	15,923	--	--	--	15,923
Total	41,945	--	15,629	57,574	--	--	--	57,574
Other hardwoods								
Michigan	24,050	--	2,623	26,673	--	--	--	26,673
Wisconsin	1,174	--	11,987	13,161	--	--	--	13,161
Total	25,224	--	14,610	39,834	--	--	--	39,834

(Table 1 continued on next page)

(Table 1 continued)

Species and Destination	Production by States 1/				Imports			
	Michigan	Minnesota	Wisconsin	Regional Total	Other U.S. 2/	Canada	Total imports	Total receipts
Total hardwood roundwood								
Michigan	2,050,098	--	232,420	2,282,518	--	--	--	2,282,518
Minnesota	--	1,729,154	24,504	1,753,658	--	29,834	29,834	1,783,492
Wisconsin	173,348	55,887	1,696,019	1,925,254	--	--	--	1,925,254
Exported 3/	--	16,202	--	16,202	--	--	--	--
Total	2,223,446	1,801,243	1,952,943	5,977,632	--	29,834	29,834	5,991,264
Residue, hardwoods								
Michigan	162,169	--	18,139	180,308	15,467	2,343	17,810	198,118
Minnesota	--	55,718	1,818	57,536	--	--	--	57,536
Wisconsin	14,279	--	243,702	257,981	--	--	--	257,981
Exported 3/	--	--	4,318	4,318	--	--	--	--
Total	176,448	55,718	267,977	500,143	15,467	2,343	17,810	513,635
All hardwoods								
Michigan	2,212,267	--	250,559	2,462,826	15,467	2,343	17,810	2,480,636
Minnesota	--	1,784,872	26,322	1,811,194	--	29,834	29,834	1,841,028
Wisconsin	187,627	55,887	1,939,721	2,183,235	--	--	--	2,183,235
Exported 3/	--	16,202	4,318	20,520	--	--	--	--
Total	2,399,894	1,856,961	2,220,920	6,477,775	15,467	32,177	47,644	6,504,899
Total all roundwood								
Michigan	2,454,113	--	246,214	2,700,327	--	--	--	2,700,327
Minnesota	4,873	2,185,402	43,738	2,234,013	--	29,834	29,834	2,263,847
Wisconsin	284,239	99,161	2,494,232	2,877,632	--	--	1,081	2,878,713
Exported 3/	20,040	21,269	--	41,309	--	--	--	--
Total	2,763,265	2,305,832	2,784,184	7,853,281	--	29,834	30,915	7,842,887
Total all residue								
Michigan	233,064	--	27,524	260,588	15,467	2,343	17,810	278,398
Minnesota	--	83,625	25,066	108,691	--	--	--	108,691
Wisconsin	19,384	1,926	304,779	326,089	88,414	17,403	105,817	431,906
Exported 3/	--	196	4,318	4,514	--	--	--	--
Total	252,448	85,747	361,687	699,882	103,881	19,746	123,627	818,995
All wood material								
Michigan	2,687,177	--	273,738	2,960,915	15,467	2,343	17,810	2,978,725
Minnesota	4,873	2,269,027	68,804	2,342,704	--	29,834	29,834	2,372,538
Wisconsin	303,623	101,087	2,799,011	3,203,721	88,414	17,403	106,898	3,310,619
Exported 3/	20,040	21,465	4,318	45,823	--	--	--	--
Total	3,015,713	2,391,579	3,145,871	8,553,163	103,881	49,580	154,542	8,661,882

1/ Vertical columns of figures under the box heading "Production by States" present the amount of pulpwood cut in each State.

2/ Mostly Western States.

3/ Pulpwood shipped to mills outside of region.

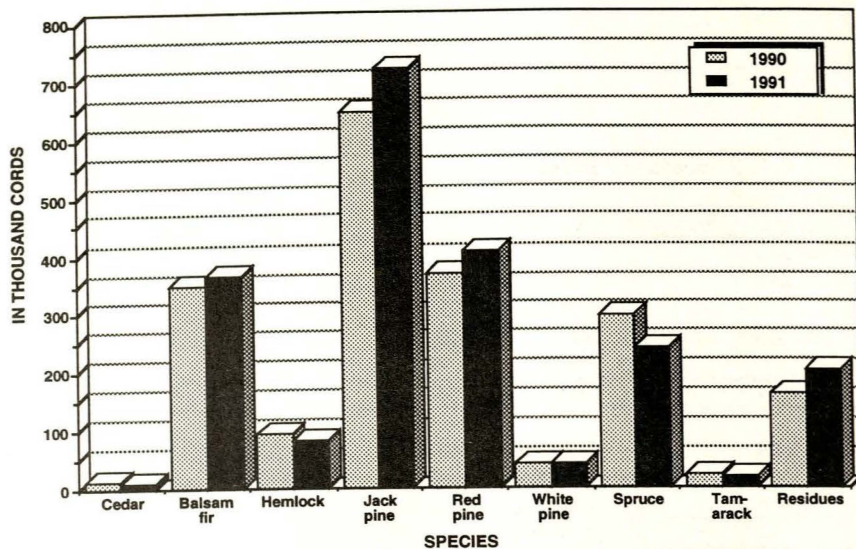


Figure 2.—Softwood pulpwood production in the Lake States, 1990-1991.

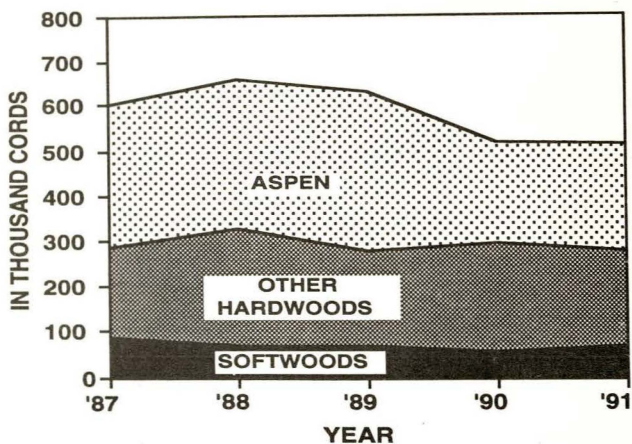


Figure 3.—Whole-tree-chip production in the Lake States, 1987-1991.

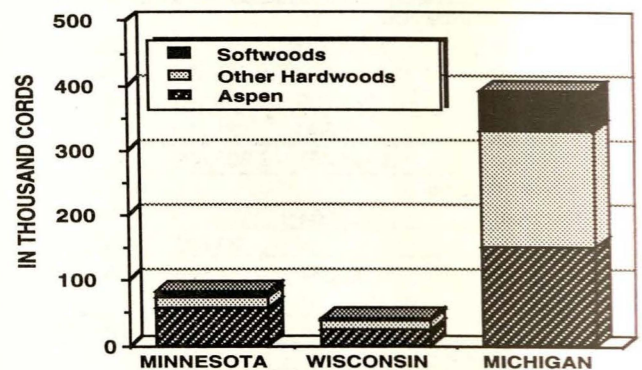


Figure 4.—WTC production by State in the Lake States, 1991.

- Michigan is the major producer of whole-tree-chips in the Lake States with 391 thousand cords (76 percent). Loggers in the Northern Lower Peninsula of Michigan harvested 257 thousand cords (50 percent) of WTC production (fig. 4).
- Jack pine was the predominant softwood species used in WTC in 1991, making up 74 percent of the softwood WTC production and 10 percent of the total WTC production.

Michigan

- Rebounding from a decline in pulpwood production in 1990, Michigan pulpwood production increased 1 percent to 3.0 million cords in 1991 (fig. 5). Increases in balsam fir, pine, and hard and soft maple production offset the declines in aspen, birch, and residue production.

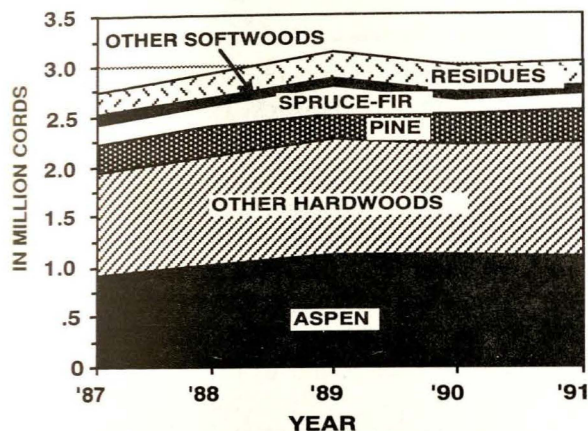


Figure 5.—Michigan pulpwood production by species group and residues, 1987-1991.

- The Western Upper Peninsula was the top producing region in Michigan with 38 percent of the roundwood harvested (fig. 6). Aspen, along with balsam poplar, white birch, hard maple, and soft maple accounted for nearly 75 percent of the pulpwood harvested in the Western Upper Peninsula and 28 percent of the pulpwood harvested in the State. Aspen pulpwood production declined 2 percent over last year's 1,115 thousand cords. More aspen pulpwood was harvested from the Northern Lower Peninsula than from any other Survey Unit in the State. The 515 thousand cords of aspen harvested from this unit represented more than half of the unit's total pulpwood production and a fifth of the State's total pulpwood production.
- Marquette County in the Western Upper Peninsula was the top producer in the State with 306 thousand cords. The second largest producer of pulpwood was Delta County with 162 thousand cords, a 28-percent decrease from last year's harvest of

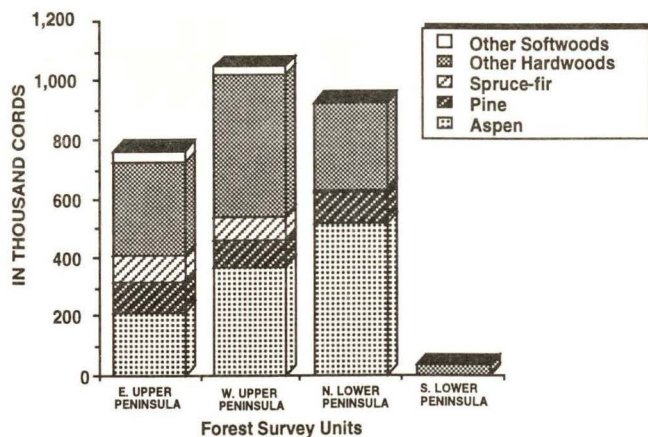


Figure 6.—Michigan pulpwood production by Forest Survey Unit and species groups, 1991.

225 thousand cords. Other counties that produced 100 thousand cords or more were Alger, Menominee, Schoolcraft, Dickinson, Houghton, Iron, and Ontonagon.

Minnesota

- Pulpwood production including residues increased 1 percent to 2.39 million cords in 1991 (fig. 7).
- The Northern Pine Unit remains the top pulpwood producing area in Minnesota with 1.2 million cords (fig. 8). Aspen pulpwood harvests accounted for nearly 80 percent of the Northern Pine Unit's pulpwood production and more than 40 percent of the entire State's pulpwood production.

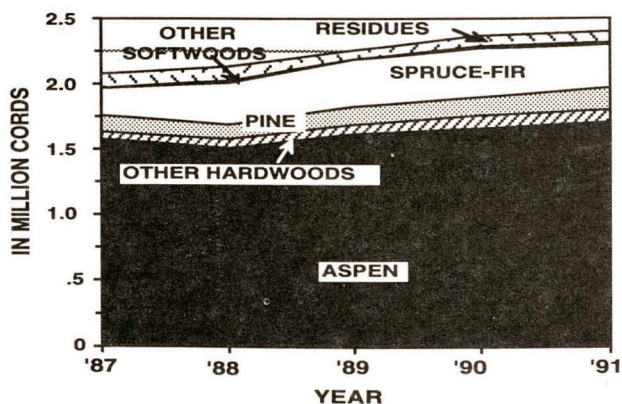


Figure 7.—Minnesota pulpwood production by species group and residues, 1987-1991.

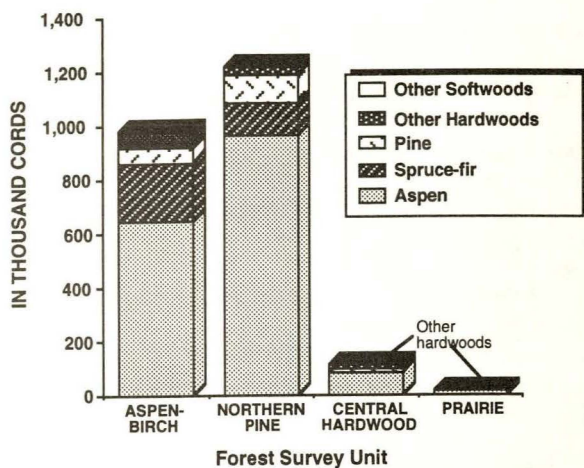


Figure 8.—Minnesota pulpwood production by Forest Survey Unit and species group, 1991.

- Aspen pulpwood production increased to a new high of 1.7 million cords, a 5-percent increase over last year.
- Softwood roundwood production declined 4 percent or 18 thousand cords from last year. Spruce production decreased 28 percent or 39 thousand cords. Jack pine pulpwood harvests increased nearly 25 percent over last year's 114 thousand cords. Red pine production increased 5 percent from 19 thousand cords to 20 thousand cords.
- St. Louis County, in the Aspen-Birch Unit, remains the top producing county with 495 thousand cords, a 3-percent decrease from last year. Itasca County is the second largest producer of pulpwood in the State with 364 thousand cords, a 4-percent drop from last year's total of 380 thousand cords. Other counties producing more than 100 thousand cords were Koochiching, Beltrami, and Cass.

Wisconsin

- Pulpwood production in Wisconsin increased 2 percent to 3.14 million in 1991. The increased production came mainly from increased use of hardwood residues (fig. 9).

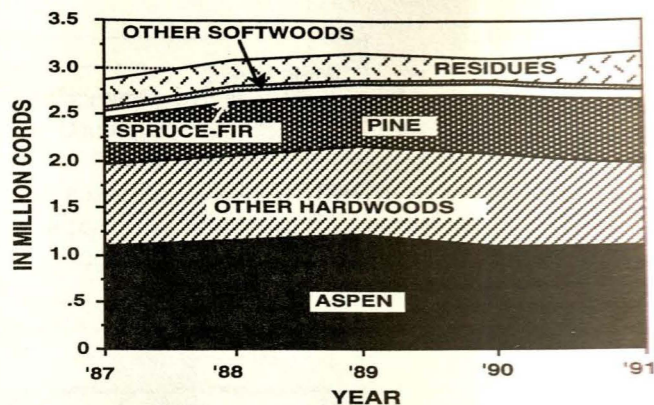


Figure 9.—Wisconsin pulpwood production by species group and residues, 1987-1991.

- Aspen harvest dropped 1 percent from 1,090 thousand cords in 1990. Other hardwoods (hard maple, soft maple, white birch, ash, basswood, elm, and yellow birch) accounted for 28 percent of the State's pulpwood production in 1991.
- Pine pulpwood production in Wisconsin accounted for 25 percent of the total harvest. Jack pine was the major softwood species harvested with 42 percent of all softwood production.
- The Northwest and Northeast Survey Units were the top pulpwood producing areas in Wisconsin with 39 percent and 38 percent of total pulpwood production respectively (fig. 10). The Central Unit was the largest producer of pine pulpwood with 40 percent of all pine harvested in the State.

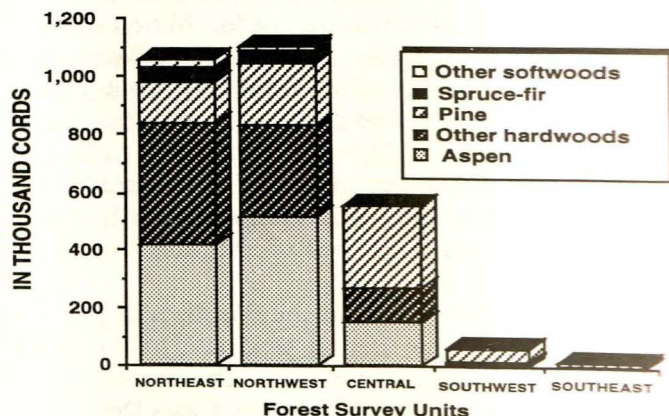


Figure 10.—Wisconsin pulpwood production by Forest Survey Unit and species group, 1991.

- Bayfield County in the Northwest Unit was the top pulpwood producing county in the State in 1991 with 193 thousand cords, a 13-percent increase in harvest from 1990. The second largest pulpwood producing county was Oneida with 179 thousand cords, a 1-percent decrease over 1990. Other top-producing counties with 100 thousand cords or more were Marinette, Sawyer, Forest, Langlade, Lincoln, Ashland, Douglas, Iron, Price, and Vilas.

- In this report, we show the distribution of the harvest in two ways: first, the amount of pulpwood cut relative to the growing-stock volume in each of five major pulpwood species (fig. 11); and, second, the amount of pulpwood relative to commercial timberland area (fig. 12).

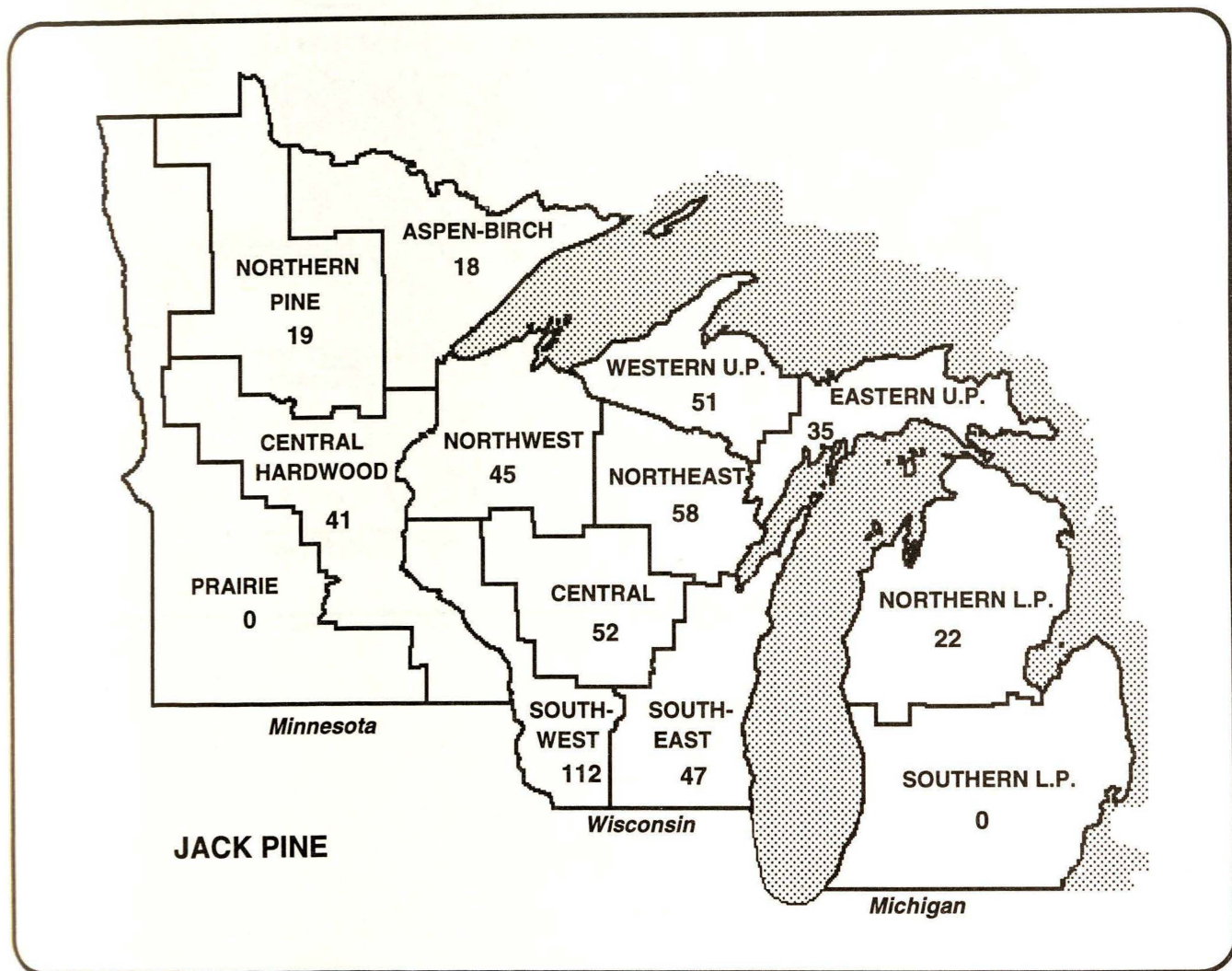
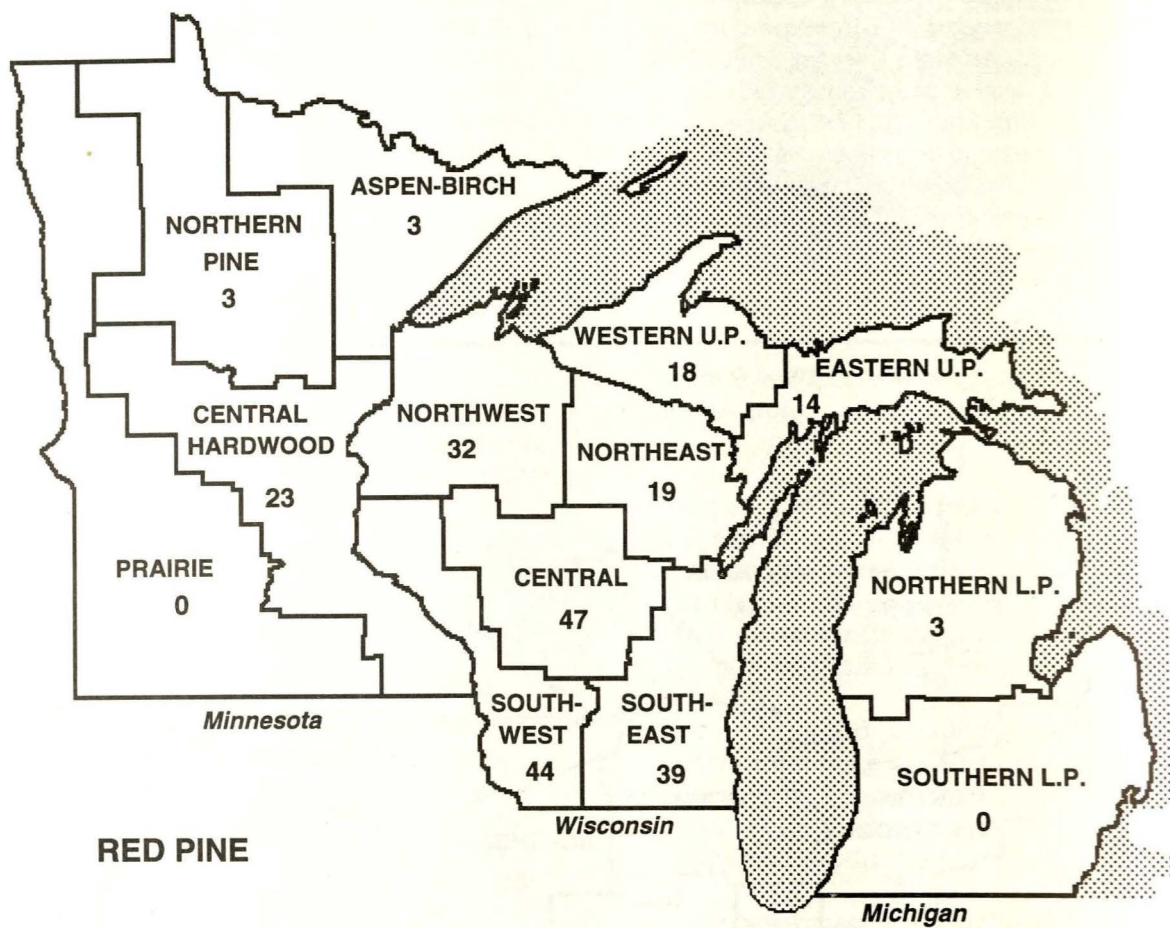
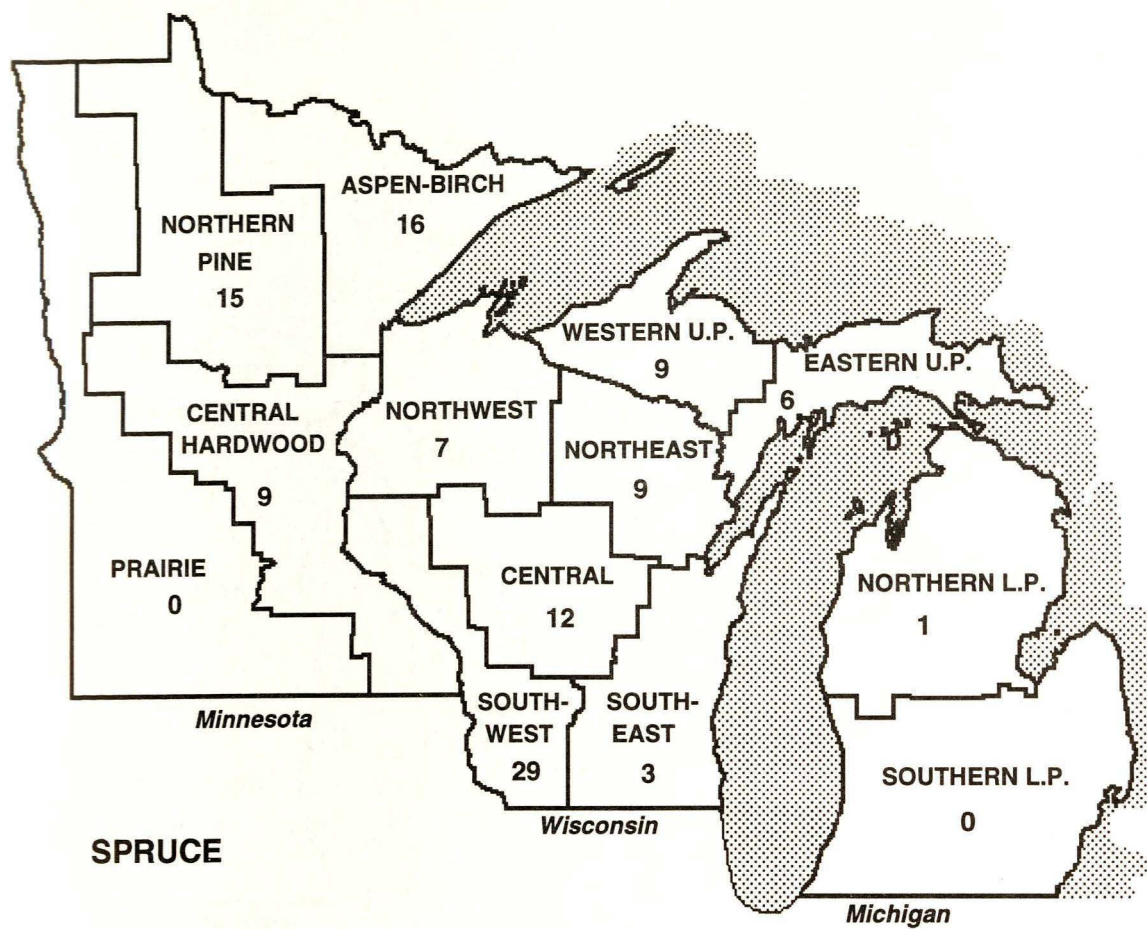
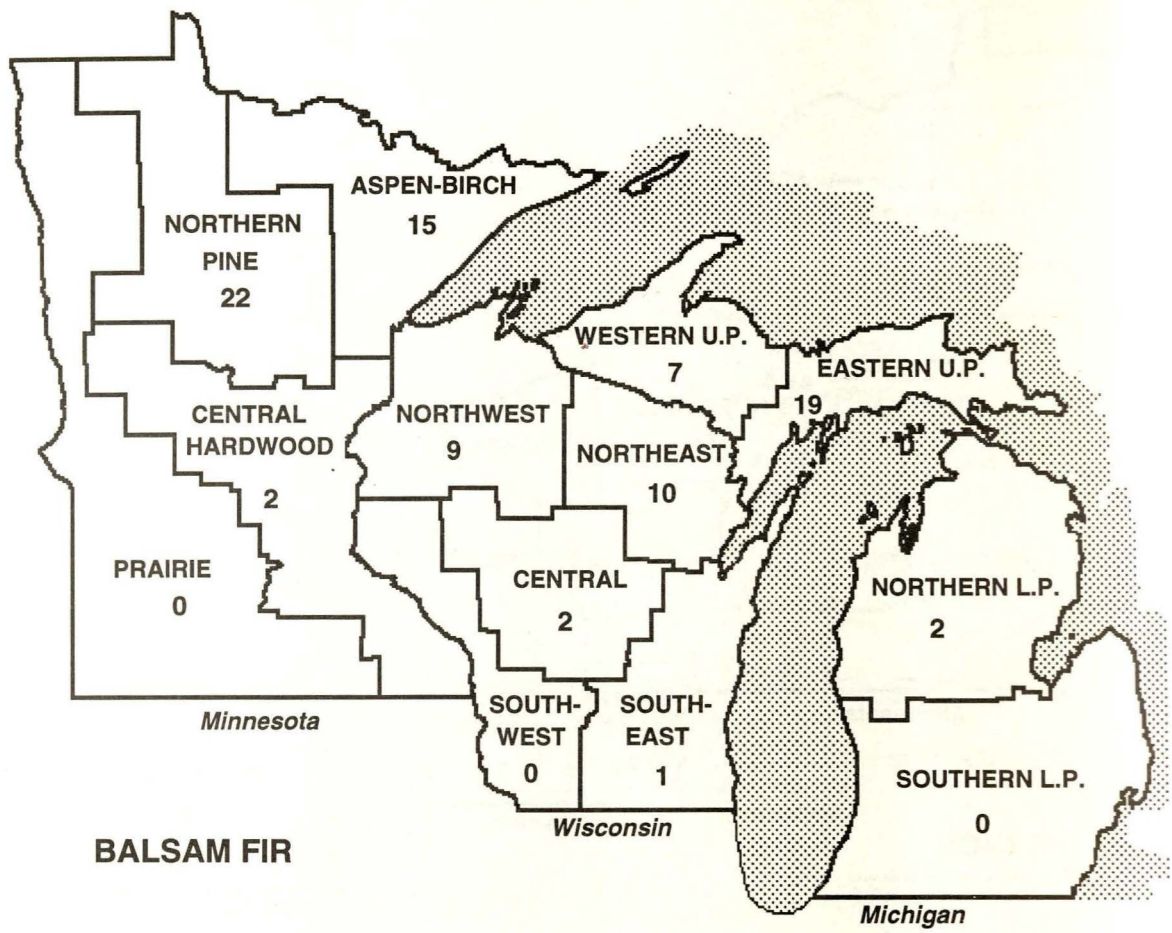
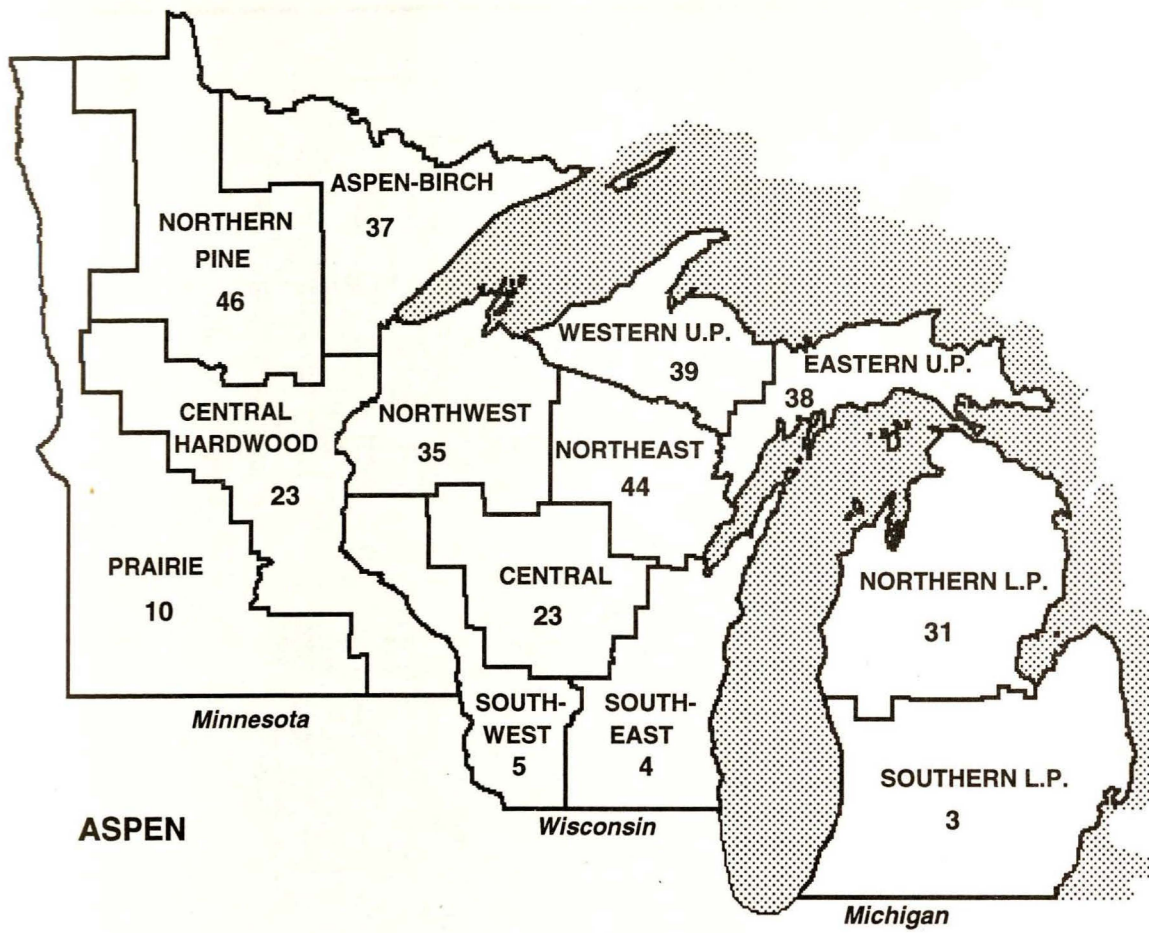


Figure 11.—Cords of roundwood pulpwood (including chips from roundwood) harvested per 1,000 cords of growing-stock volume for each of five principal pulpwood species by Forest Survey Unit, 1991. Growing-stock volume was determined during the last forest inventory in each State.









LAKE STATES

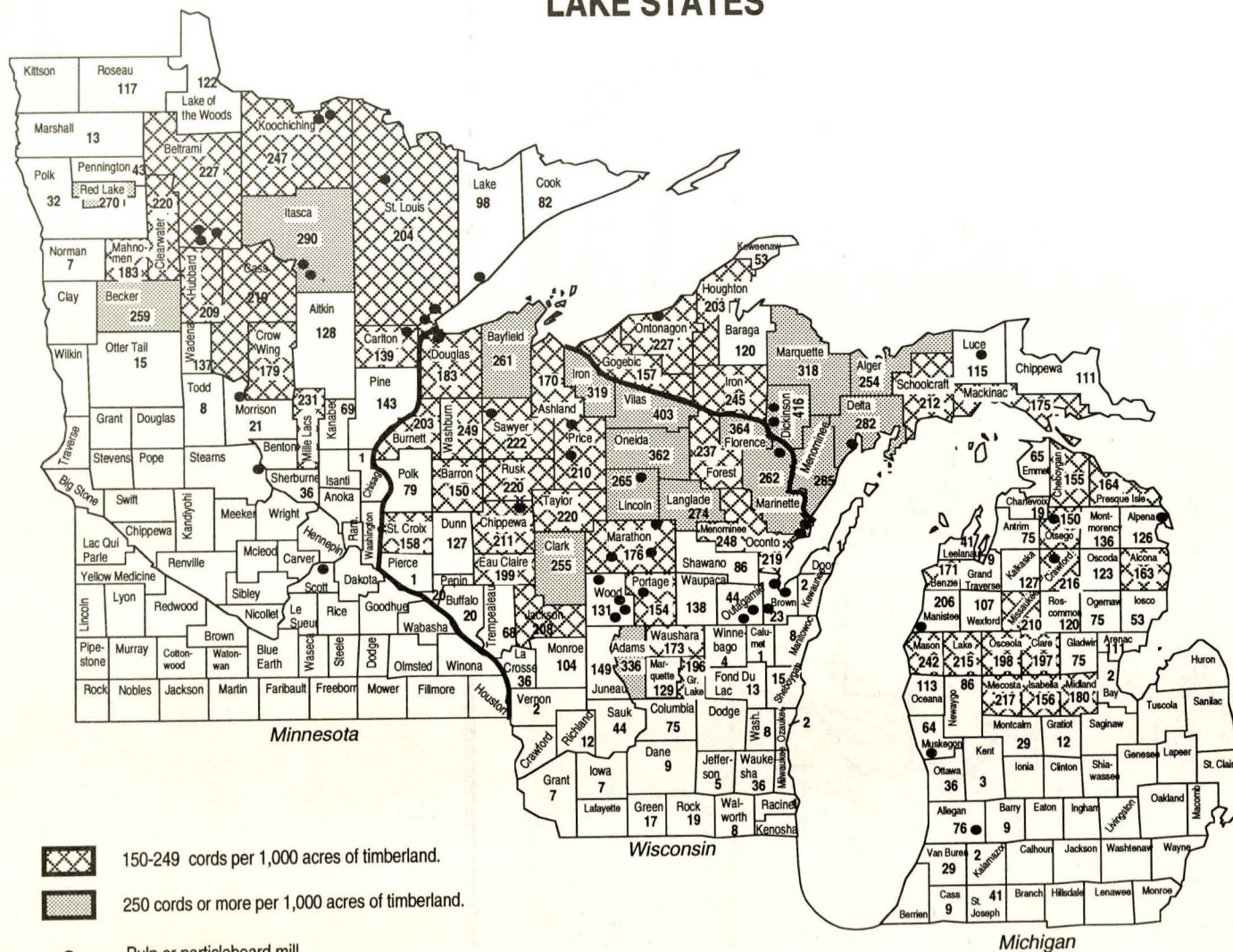


Figure 12.—Cords of pulpwood cut per 1,000 acres of timberland in principal pulpwood-producing counties, 1991. Acres of timberland (stocking of trees greater than 16.7 percent) were determined during the last inventory in each State. Locations of active pulp and particleboard mills are shown.

Pulpwood harvesting was most intensive (80 thousand cords or more in the following areas by species:

Species	State	Survey Unit
Jack pine	Wisconsin	Northwest, Central
	Michigan	Northern Lower Peninsula
	Minnesota	Northern Pine
Red pine	Wisconsin	Central
Spruce	Minnesota	Aspen-Birch
Balsam fir	Minnesota	Aspen-Birch, Northern Pine
Aspen	Minnesota	Aspen-Birch, Northern Pine
		Central Hardwood
	Wisconsin	Northeast, Northwest, Central
	Michigan	E. Upper Peninsula, W. Upper Peninsula, N. Lower Peninsula

- Cutting of certain species may exceed net growth in several Survey Units of the Lake States. This disparity is probably due to disease and mortality occurring in these species. Harvesting of overmature stands may be another reason. Future field surveys should help clarify these points.

Receipts

- Thirty-six woodpulp and twelve particle-board mills in the Lake States acquired 8.6 million cords of pulpwood in 1991, up 2 percent from 1990. The number of mills using aspen stayed constant at 40 (83 percent). There was increased use of other hardwoods (cherry and ironwood) and softwood residues, by some mills (fig. 13).

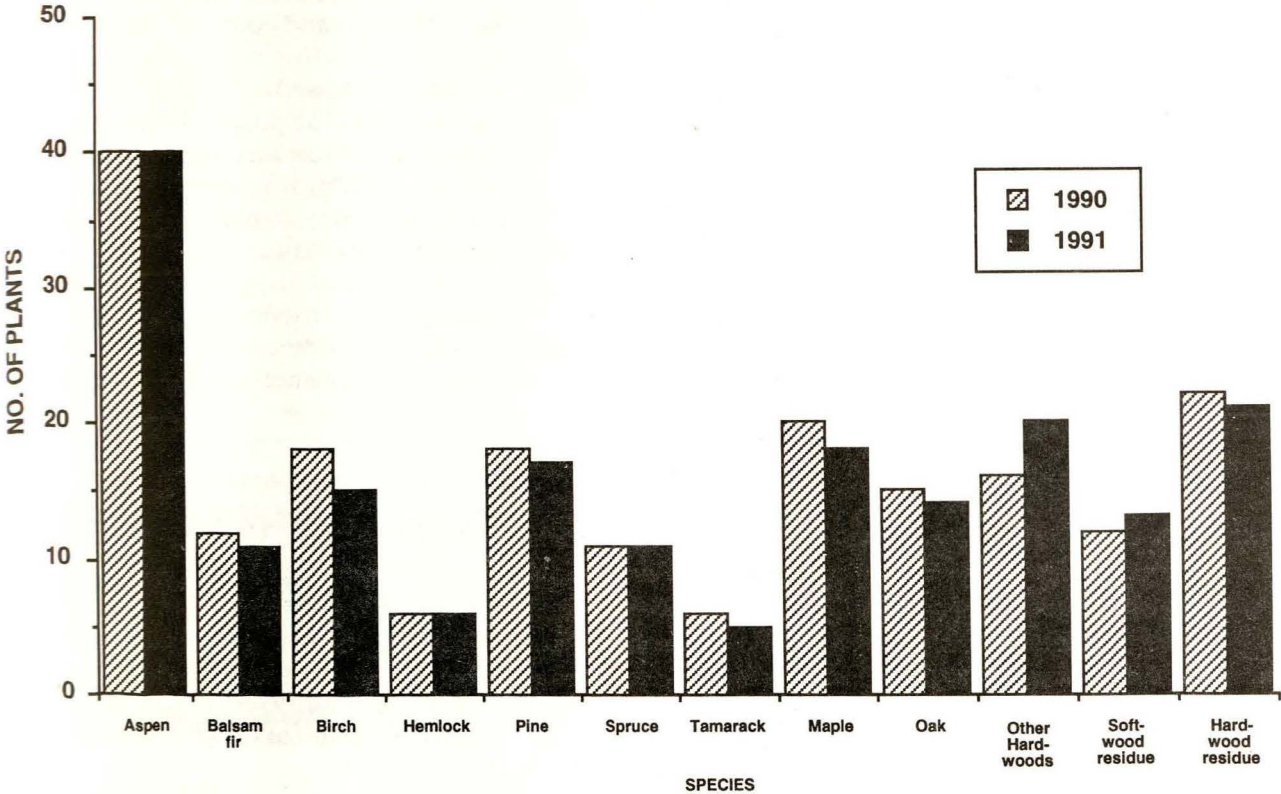


Figure 13.—Numbers of industrial plants in the Lake States using a particular species or residue for pulping and particleboard, 1990-1991.

Industry Trends and Analysis

Pulp Mills

In this section pulp mills will include wood fiber products such as paper, paperboard, hardboard, insulation board, and medium-density fiber board. All of these products are manufactured from wood that has been reduced to individual fibers, small fiber bundles, or fiber parts, which are subsequently formed into a mat.

- The Lake States provide many pulpwood mills with raw material. In 1991, Wisconsin supplied wood to 25 mills, Michigan supplied 26 mills, and Minnesota supplied 22 mills. Pulpwood mills outside the Lake States also received raw material from this region. Some 41 thousand cords were exported, mainly to Canada; Minnesota exported 21 thousand cords and Michigan exported 20 thousand cords.
- Softwood residue imported from Canada declined 2 percent in 1991 to 17 thousand cords. Softwood residue imported from States outside the region decreased 18 percent to 88 thousand cords. The main suppliers of the softwood residue from outside the Lake States are Montana, South Dakota, and Wyoming.

Michigan

- Eleven Michigan mills consumed 2.7 million cords, down 7 percent from last year. An estimated 264 thousand cords were supplied by out-of-State sources—down 1 percent from 1990. Wisconsin provided more than 90 percent of the imported wood. White birch, hard maple, aspen, balsam poplar, and soft maple were the primary species imported.

Wisconsin

- The 21 mills in Wisconsin consumed 2.9 million cords—a decline of 12 percent from 1990. Of that total, 414 thousand cords were supplied by out-of-State sources—a decrease of 27 percent from last year. Michigan supplied 284 thousand cords, Minnesota supplied 99 thousand cords, and Western States supplied 88 thousand cords. Principal imports were aspen, spruce, jack pine, and hard maple.

Minnesota

- The 16 mills in Minnesota reported consuming an estimated 2.4 million cords—Minnesota pulpwood receipts are not fully reported (see earlier explanation). Wisconsin furnished 69 thousand cords, Michigan 5 thousand cords, and Canada 30 thousand cords. Principal imports were aspen, balsam fir, spruce, soft maple, and jack pine.

- Of the 8.6 million cords of pulpwood harvested in 1991, 6.3 million cords (73 percent) were used for wood fiber products (pulp). Of each cord used to produce pulp, 92 percent was roundwood and 8 percent was residues.
- Principal species harvested for pulp were aspen (2.1 million cords), jack pine (595 thousand cords), hard maple (540 thousand cords), and soft maple (420 thousand cords). Other major species furnishing more than 200 thousand cords were balsam fir, red pine, spruce, and white birch. Hardwood and softwood residue accounted for 506 thousand cords of pulp in 1991.
- Aspen and other hardwoods are still the mainstays of the pulp mills in the region, but softwood use has increased steadily since 1988 (fig. 14). Residues for the same period have been steady at 450 to 500 thousand cords.
- Average daily woodpulp production was 13.6 thousand tons per day in 1991 (table 3). Kraft mills accounted for 40 percent of

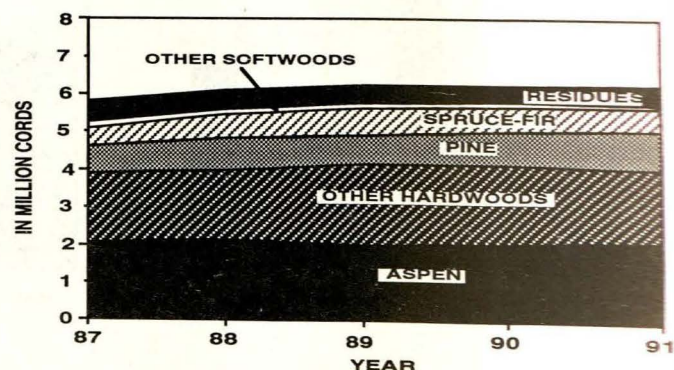


Figure 14.—Pulpwood production in the Lake States for pulp by species group, and residues, 1987-1991.

the total production, and groundwood and other mechanical process mills accounted for 31 percent. The remaining 29 percent was split between sulfite and semi-chemical process mills.

- Lake States pulpwood production for pulp mills in 1989-1991 was:

Species	Production		
	1989	1990	1991
	<i>(Thousand cords)</i>		
Roundwood			
Aspen	2,008	2,029	2,095
Softwoods	1,662	1,677	1,718
Other species	2,090	2,070	1,948
Residue	470	450	506
Total	6,230	6,226	6,267

Michigan

- Pulpwood production for wood fiber was 2.2 million cords in 1991. Aspen was the major pulpwood species harvested in the State with 600 thousand cords. Other species that contributed large amounts of wood were hard maple (328 thousand cords) and soft maple (233 thousand cords). Hardwood residue was a major contributor to the pulp industry with 137 thousand cords; softwood residue was 7 thousand cords.
- Michigan's primary wood fiber industry produces paper, corrugating medium, hardboard, and market pulp. An estimated 4,375 tons of pulp products are generated daily from the seven primary pulp mills. Two mills use groundwood processing, three mills use kraft processing, and three use semi-chemical process (table 3).
- Of the 238 thousand cords of pulpwood imported to Michigan mills for processing, Wisconsin provided 223 thousand cords, and Western States provided 15 thousand cords. The State of Michigan exported 20 thousand cords to other States outside the region for wood fiber. Balsam fir (8 thousand cords) and spruce (12 thousand cords) were the two species exported.

Minnesota

- Pulpwood harvested for wood fiber products totaled 1.4 million cords in 1991. Aspen

was the predominant species harvested in Minnesota with 734 thousand cords. Balsam fir (197 thousand cords) and spruce (141 thousand cords) were second and third, respectively. Jack pine was the only other species harvested for pulp, with more than 100 thousand cords. Hardwood and softwood residues for pulp amounted to 56 thousand cords and 28 thousand cords, respectively.

- Primary wood fiber products industries in Minnesota are paper, hardboard, roofing felt, and insulation board. An estimated 3,475 tons of pulp products were produced daily from the 10 primary pulp mills. The processes used in these mills to break down the wood into fiber are groundwood (four mills), other mechanical (three mills), and kraft (two mills) (table 3).
- Of the 104 thousand cords imported to Minnesota mills for pulp products, Michigan provided 5 thousand cords, Wisconsin furnished 69 thousand cords, and Canada provided 30 thousand cords. Minnesota exported 70 thousand cords to Wisconsin and 21 thousand cords to other States and Canada. Predominant species exported were aspen (16 thousand cords), balsam fir (2 thousand cords), jack pine (2 thousand cords), and spruce (2 thousand cords).

Wisconsin

- Pulpwood cut for wood fiber products totaled 2.7 million cords. Aspen was the main species harvested with 761 thousand cords in 1991. Other species producing more than 100 thousand cords were jack pine (339 thousand cords), white birch (253 thousand cords), red pine (322 thousand cords), hard maple (212 thousand cords), and soft maple (166 thousand cords). Softwood residue for pulp accounted for 74 thousand cords, and hardwood residue was 204 thousand cords.
- Primary wood fiber products industries in Wisconsin are paper, hardboard, and roofing felt. An estimated 5,763 tons of pulp products were produced daily from the 19 primary pulp mills. The processes used in these mills to break down the wood into fiber are groundwood and other mechanical (eight mills), sulfite (six mills), kraft (four mills), and semichemical (two mills) (table 3).

- Wisconsin mills imported 455 thousand cords of pulpwood; 281 thousand cords from Michigan, 70 thousand cords from Minnesota, 89 thousand cords from Western States, and 15 thousand cords from Canada. Wisconsin exported 223 thousand cords to Michigan, 69 thousand cords to Minnesota, and 4 thousand cords to mills outside the region. The predominant species exported were white birch (79 thousand cords), hard maple (53 thousand cords), soft maple (36 thousand cords), and aspen (22 thousand cords). Softwood and hardwood residues for pulp accounted for 32 thousand cords and 24 thousand cords, respectively.

Outlook

- A 2-percent increase in pulpwood production for wood fiber (pulp) mills in the Lake States during 1991 compares favorably with the 0.8-percent rise in U.S. paper and paperboard production.
- Total output of the U.S. paper and paperboard industry for 1991 was 78 million tons (38.5 million tons of paper and 39.5 million tons of paperboard).
- Pulpwood consumption in the U.S. totaled 98 million cords in 1991.

Particleboard Mills

Particleboard is a generic term for a panel manufactured from lignocellulosic material—commonly wood—essentially in the form of particles (as distinct from fibers). These materials are bonded together with synthetic resin or other suitable binder under heat and pressure, by a process in which the interparticle bonds are created wholly by the added binder and to which other materials may have been added during manufacture to improve certain properties. The many types of particleboard differ greatly in regard to size and geometry of the particle, the amount of resin (adhesive) used, and the density to which the panel is pressed.

The major types of particles used for particleboard are shavings, flakes, wafers, chips, sawdust, strands, slivers, and wood wool (excelsior). Most particleboard in the U.S. is made from residues (shavings, sawdust, or chips), but some types require roundwood (saw logs or pulpwood). Wafer board is an example of a product requiring that particles be cut from solid wood.

- Lake States loggers harvested 2.3 million cords of pulpwood in 1991 for particleboard products. For every 100 cords of pulpwood used in particleboard manufacture, 91 percent came from roundwood and 9 percent was residues from wood-using plants (sawmills, veneer mills, etc.).
- Principal species harvested for particleboard products were aspen (1.8 million cords), jack pine (127 thousand cords), and soft maple (54 thousand cords). Other major species used were red pine and white birch. Residues used in particleboard production totaled 194 thousand cords (fig 15).

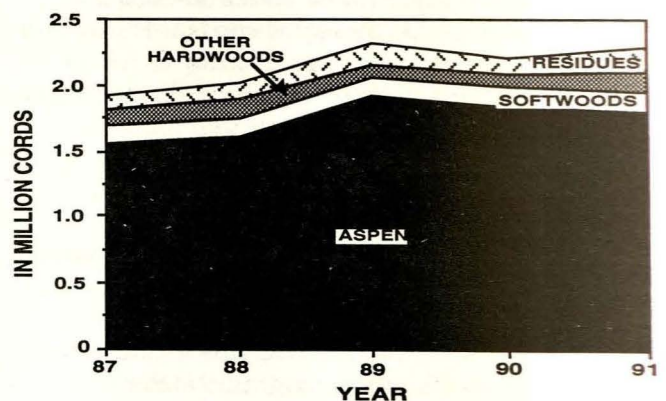


Figure 15.—Pulpwood production for particleboard in the Lake States, 1987-1991.

- Annual production capacity of the Lake States particleboard plants is 1,706 million square feet, as shown on the next page:

Company	Location	Production capacity (<i>Million square feet</i> <i>3/4-inch basis</i>)
Georgia-Pacific	Gaylord, MI	227
Louisiana-Pacific	Newberry, MI	55
Louisiana-Pacific	Sagola, MI	180
Weyerhaeuser Co.	Grayling, MI	180
Louisiana-Pacific	Two Harbors, MN	65
Potlatch Corp.	Grand Rapids, MN	165
Northwood Panelboard Co.	Solway, MN	160
Potlatch Corp.	Bemidji, MN	240
Potlatch Corp.	Cook, MN	122
Louisiana-Pacific	Hayward, WI	230
Rodman Industries	Marinette, WI	22
Weyerhaeuser Co.	Marshfield, WI	60
All companies		<u>1,706</u>

- Lake States pulpwood production for particleboard mills in 1989-1991 was:

Species	Production		
	1989	1990	1991
	<i>(Thousand cords)</i>		
Roundwood			
Aspen	1,914	1,840	1,786
Softwoods	144	140	158
Other species	89	103	148
Residue	161	126	194
Total	2,308	2,209	2,286

- Although national housing starts dropped 15 percent in 1991 to 1.0 million units, an increase in remodeling and development of new particleboard-based products accounted for a 4-percent increase in Lake States pulpwood production for particleboard products.

Michigan

- Pulpwood harvested for particleboard products totaled 842 thousand cords in 1991, of which aspen made up 494 thousand cords. Other major species cut were jack pine (91 thousand cords) and soft maple (54 thousand cords). Hardwood and softwood residues used for particleboard totaled 109 thousand cords.
- Michigan's particleboard industry produces oriented-strand board, oriented wafer

board, and particleboard. An estimated capacity of 613 million square feet at 3/4-inch thickness can be produced by the four mills in Michigan. Three mills used roundwood for raw material and one mill used whole-tree-chips from the field and mill residues in their process.

- The particleboard mills in Michigan imported more than 2 thousand cords of hardwood residue from Canada. Michigan mills also received 45 thousand cords of aspen from Wisconsin. Raw materials exported for particleboard production amounted to 22 thousand cords; half was aspen and the other half residues.

Minnesota

- Timber logged for particleboard products totaled 1.0 million cords. The predominant species cut was aspen with 964 thousand cords, or 96 percent of the total. The remaining 4 percent was comprised of jack pine (30 thousand cords), balsam poplar (10 thousand cords), white birch (3 thousand cords), and softwood residues (2 thousand cords).
- Minnesota's particleboard industry produces oriented-strand board and oriented wafer board. Particleboard output capacity from the mills in the State was an estimated 582 million square feet at 3/4-inch thickness for 1991. Roundwood was the predominant form of raw material used for particleboard products in the State.
- The particleboard mills in Minnesota did not import any raw materials for production. In 1991, raw materials exported from the State for particleboard manufacturing totaled 31 thousand cords; 29 thousand cords of aspen and 2 thousand cords of softwood residues were shipped to Wisconsin.

Wisconsin

- Wisconsin produced 426 thousand cords of wood for particleboard manufacturing. The main species harvested was aspen with 328 thousand cords, or 88 percent of the total. Other major species cut were jack pine (6 thousand cords), balsam poplar (5 thousand cords), red pine (2 thousand cords), and

balsam fir (2 thousand cords). The remaining raw material used was softwood residue (20 thousand cords) and hardwood residue (64 thousand cords).

- The particleboard industry in Wisconsin produces particleboard and oriented-strand board. Wisconsin's particleboard output capacity totaled an estimated 267 million square feet at 3/4-inch thickness in 1991. The mills used equal amounts of roundwood and residues for raw material in manufacturing particleboard products.
- The mills in Wisconsin imported 56 thousand cords of wood for particleboard manufacturing; of these, Canada provided 3 thousand cords of softwood residues, Michigan provided 11 thousand cords of aspen and 11 thousand cords of residues, and Minnesota provided 31 thousand cords of wood (29 thousand cords of aspen and 2 thousand cords of softwood residues). Wisconsin exported more than 50 thousand cords of aspen to Michigan particleboard mills in 1991.

New Mills and Expansions

These major pulp mill expansion and new construction efforts are underway:

- The expansion program of Consolidated Papers, Inc., is scheduled to be completed in the near future.
- Louisiana-Pacific Corp. is building an OSB (oriented-strand board) plant in Tomahawk, Wisconsin, which is scheduled to be completed in 1993.
- The Combined Locks, Wisconsin expansion of Appleton Papers, Inc., is scheduled for completion in 1994.

Idle, Closed, or Converted Mills

One major pulp mill is closing:

- Green Bay Packaging Inc. in Green Bay, Wisconsin (closing pulp mill only).

CENTRAL STATES

Production

- Pulpwood production in the Central States (Illinois, Indiana, Iowa, and Missouri) dropped 9 percent from the 1990 production of 374 thousand cords to 339 thousand cords in 1991. Hardwood residue from primary wood-using mills made up 70 percent of total production. Softwood roundwood increased from 9 thousand cords in 1990 to 11 thousand cords in 1991 (fig. 16).

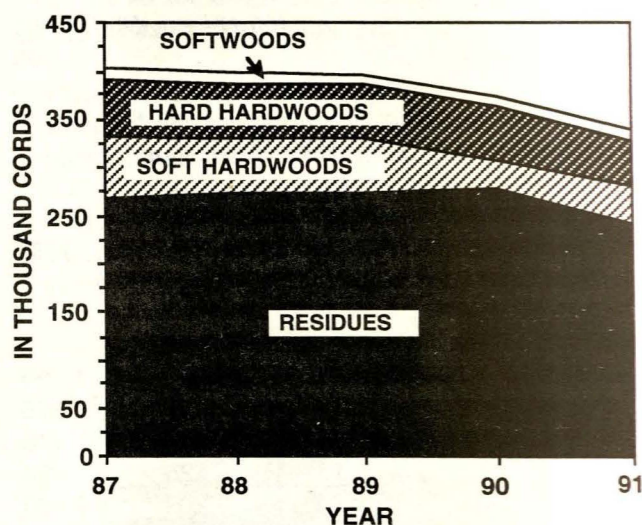


Figure 16.—Pulpwood production in the Central States, 1987-1991.

- Soft hardwood⁷ roundwood pulpwood production increased by 35 percent—from 31 thousand cords in 1990 to 42 thousand cords in 1991. Hard hardwood⁸, on the other hand, decreased from 56 thousand cords in 1990 to 46 thousand cords in 1991—an 18-percent decline. Exports of roundwood and residues from the Central States decreased 8 percent to 215 thousand cords. Central States pulpwood was shipped to Kentucky, Wisconsin, Oklahoma, and Michigan mills.

⁷Hardwood species with an average specific gravity of 0.50 or less.

⁸Hardwood species with an average specific gravity greater than 0.50.

- The primary wood fiber industries in the Central States are roofing insulation and corrugating-medium. An estimated 720 tons of woodpulp products were produced daily from three mills. The processes used in these mills to break down the wood into fiber are semi-chemical and mechanical.
- Loggers harvested pulpwood in 17 counties of Illinois; in 14 counties in western and central Indiana; in 5 counties in eastern Iowa; and in 10 counties in northeast, central, and southeast Missouri (fig. 17).

Illinois

- Illinois produced 81 thousand cords of pulpwood in 1991, 24 percent of the total production in the Central States (fig. 18). Soft hardwood was the largest species group of roundwood harvested from Illinois with 19 thousand cords or 23 percent of the State total. Hard hardwood was the second largest species group, although reduced from 20 thousand cords in 1990 to 17 thousand cords in 1991. Softwoods comprised 12 percent of the total pulpwood production in Illinois. Hardwood residues accounted for 42 percent of the pulpwood production in the State.
- Illinois does not have any primary wood-pulp mills, so all pulpwood harvested is shipped to plants outside the State. Of the pulpwood harvested in 1991, about 46 percent was shipped to mills in the Central States—mainly Indiana and Iowa—and the remaining 54 percent was sent to States outside the region, such as Kentucky.

Indiana

- Pulpwood production in Indiana accounted for almost half of the total pulpwood harvested in the Central States region in 1991, 157 thousand cords. Roundwood pulpwood production in Indiana was 29 thousand cords or 18 percent of the State total. The hard hardwood species group had the highest production of roundwood with 76 percent. Soft hardwoods accounted for the remaining 24 percent of the roundwood harvested. Hardwood residues accounted for 82 percent of the pulpwood produced in Indiana.

- Pulpwood shipped to mills outside the north-central region totaled 101 thousand cords, 64 percent of the States total pulpwood production. The remaining 36 percent was used by mills in the Central and Lakes States regions.

Iowa

- The total pulpwood production in 1991 was 14 thousand cords, 4 percent of the region's total. Soft hardwood pulpwood production was 6 thousand cords or 43 percent of the State's total. Hard hardwood harvested for pulp was 2 thousand cords of the 1990 production. Hardwood residues accounted for 43 percent of pulpwood production in Iowa or 6 thousand cords.

Missouri

- Missouri was the second largest producer of pulpwood material in the Central States region at 87 thousand cords or 26 percent of the region's total. The largest roundwood species group harvested in the State for pulp soft hardwood accounted for 11 percent of Missouri's total pulpwood production. Hard hardwood species produced 5 thousand cords of roundwood or 6 percent of the State total pulpwood harvest. Residues, the main source of pulpwood fiber, accounted for the remaining 82 percent of the total pulpwood production in Missouri.
- Missouri exported 70 thousand cords or 80 percent of the State's pulpwood production to mills outside the region, mainly in Kentucky and Oklahoma.

Receipts

- Pulp mills in three Central States received 129 thousand cords in 1991, down 9 percent from 1990. Total roundwood receipts remained at the 1990 level of 44 thousand cords. Soft hardwood accounted for a 38-percent increase in receipts while hard hardwood receipts declined 46 percent between 1990 and 1991.
- Hardwood residue decreased 14 percent from 97 thousand cords in 1990 to 85 thousand cords in 1991.

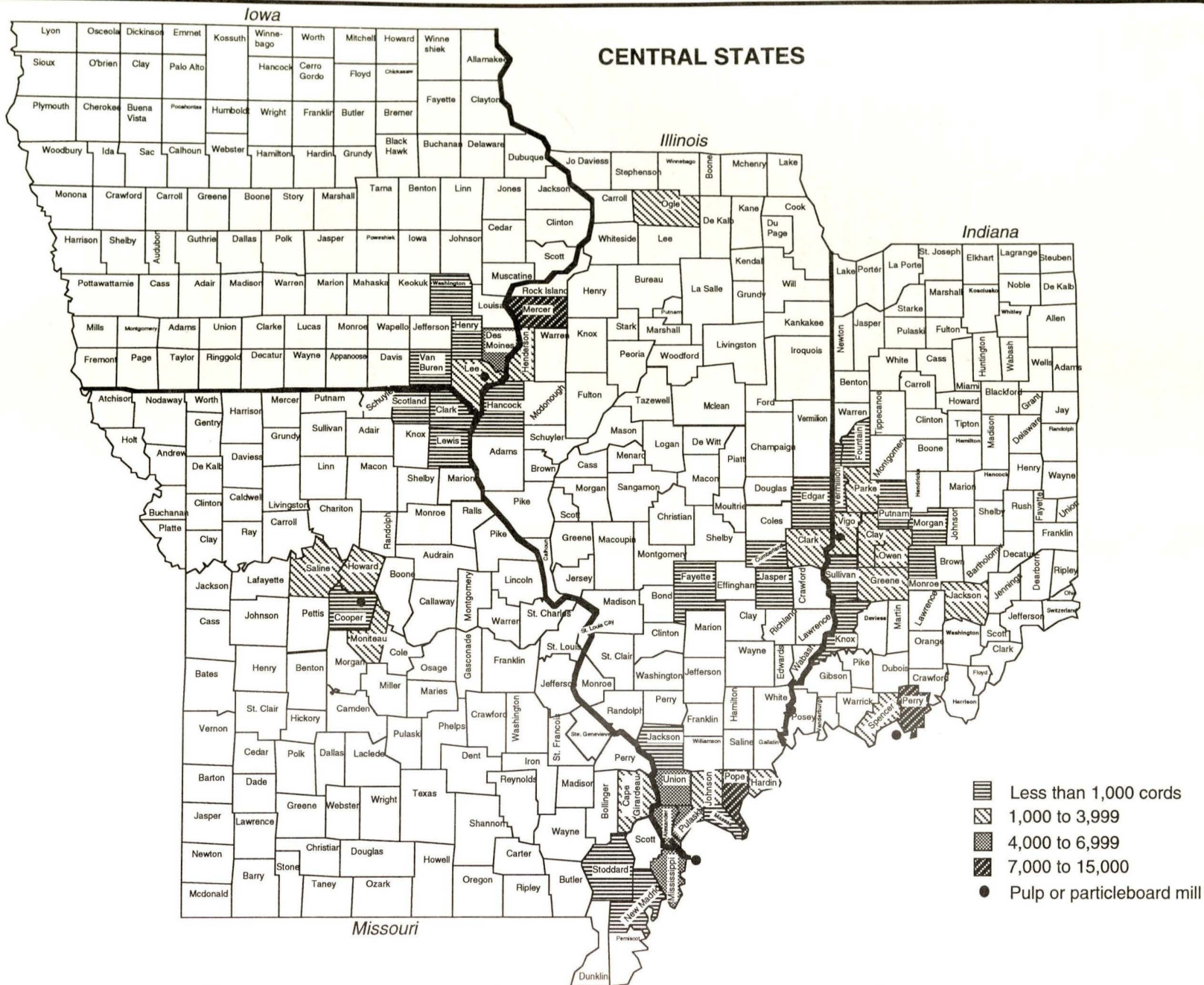


Figure 17.—Production of pulpwood from roundwood (including chips from roundwood) in the Central States by counties, in

Conversion Factors Used in the Lake States

Standard cords of green roundwood per green ton:

Species	Factor
Cedar	0.6329
Balsam fir	.4688
Hemlock	.4150
Jack pine	.4688
Red pine	.4688
White pine	.4777
Spruce	.5014
Tamarack	.4291
Ash	.4330
Aspen	.4291
Balsam poplar	.4083
Basswood	.5167
Beech	.3956
White birch	.4018
Yellow birch	.3723
Cottonwood	.4291
Elm	.4018
Hickory	.3701
Hard maple	.3617
Soft maple	.4083
Red oak	.3444
White oak	.3723
Other species	.4688

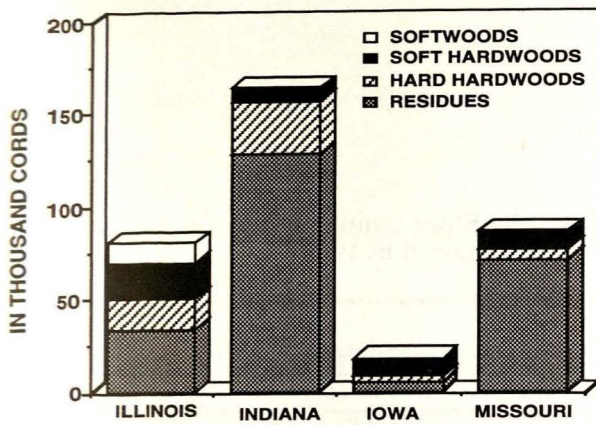


Figure 18.—Central States pulpwood production by species group, 1991.

- No softwoods were used for pulpwood for the eighth consecutive year in the Central States.

Industry Trends and Analysis

- Average daily pulp production remained the same from 1990 to 1991 at 510 tons (table 5).
- Mills in the adjacent States remain the dominant market for Central States pulpwood.
- Hardwood residue from sawmills continues to be the dominant form of pulpwood procured from Central States mills.
- Central States production of roundwood pulpwood was 99 thousand cords in 1991, up 3 percent from 1990.

Table 2.--Numbers of industrial plants in the Lake Staes using a particular species or residue for pulping and particleboard in 1991

Species and kind of material	Total Lake States	State		
		Michigan	Minnesota	Wisconsin
Aspen	40	10	15	15
Balsam fir	11	2	4	5
Birch	15	7	2	6
Hemlock	6	2	—	4
Pine	17	5	6	6
Spruce	11	2	5	4
Tamarack	6	1	2	3
Maple	20	9	1	10
Oak	15	8	—	7
Other hardwoods	16	7	1	8
Softwood residue	10	2	3	5
Hardwood residue	22	4	6	8
Total Plants ^{1/}	48	11	15	22

^{1/} Some plants use more than one species, so numbers in column are not additive.

Table 3.- Average daily production of active woodpulp mills in the Lake States by mill, location, and type of pulp produced, 1991

(In tons per 24 hours)1/

		Type of pulp				
Company	Location	All types	Sulfite	Groundwood and other mechanical		Semi- chemical
				Kraft		
Michigan						
Abitibi-Price, Inc.	Alpena	400	--	--	400	--
Champion International	Quinnesec	825	--	825	--	--
Stone Container	Ontonagon	690	--	--	--	690
Mead Corp.	Escanaba	1,300	--	1,050	250	--
Menasha Corp.	Otsego	310	--	--	--	310
Packaging Corp. of America	Filer City	600	--	--	--	600
Warren Co., S.D.	Muskegon	250	--	250	--	--
Total	7 mills	4,375	--	2,125	650	1,600
Minnesota						
Blandin Paper Co.	Grand Rapids	550	--	--	550	--
Lake Superior Paper Industry	Duluth	440	--	--	440	--
Hennepin Paper Co.	Little Falls	75	--	--	75	--
International Bildrite Inc.	International Falls	110	--	--	110	--
Boise Cascade Corp.	International Falls	1,000	--	1,000	--	--
Potlatch Corp.	Cloquet	520	--	520	--	--
Superwood Corp.	Bemidji	100	--	--	100	--
Champion International	Sartell	250	--	--	250	--
Superwood Corp.	Duluth	350	--	--	350	--
Certain-Teed Corp.	Shakopee	80	--	--	80	--
Total	10 mills	3,475	--	1,520	1,955	--
Wisconsin						
James River Corp.	Green Bay	160	160	--	--	--
Weyerhaeuser Co.	Rothschild	200	200	--	--	--
Badger Paper Mills	Peshtigo	120	120	--	--	--
Appleton Papers, Inc.	Combined Locks	200	--	--	200	--
Consolidated Papers, Inc.	Stevens Point	100	--	--	100	--
Consolidated Papers, Inc.	Wisconsin Rapids	1,453	--	900	553	--
Green Bay Packaging, Inc.	Green Bay	220	--	--	--	220
Flambeau Paper Co.	Park Falls	120	120	--	--	--
Midtec Paper Corp.	Kimberly	180	--	--	180	--
Pentair, Inc.	Niagara	250	--	--	250	--
Mosinee Paper Mills Co.	Mosinee	220	--	220	--	--
Nekoosa Papers, Inc.	Nekoosa	335	--	335	--	--
Nekoosa Papers, Inc.	Port Edwards	235	235	--	--	--
Nekoosa Packaging, Inc.	Tomahawk	1,000	--	--	--	1,000
Globe Industries	Cornell	100	--	--	100	--
Superior Fiber Products Corp.	Superior	140	--	--	140	--
Thilmany Pulp and Paper Co.	Kaukauna	420	--	420	--	--
Wausau Paper Mills Co.	Brokaw	210	210	--	--	--
Superwood Corp.	Philips	100	--	--	100	--
Total	19 mills	5,763	1,045	1,875	1,623	1,220
All States	36 mills	13,613	1,045	5,520	4,228	2,820

1/ Lockwood's Directory of the Paper and Allied Industries—1991.

Table 4.- Production and imports of pulpwood, Central States, 1991

(In standard cords, unpeeled)^{1/}

Species and destination	Production by States ^{2/}					Imports			
	Illinois	Indiana	Iowa	Missouri	Regional total	Lake States	Other U.S.	Total imports	Total receipts
Softwoods									
Exported ^{3/}	10,491	--	--	464	10,955	--	--	--	--
Total	10,491	--	--	464	10,955	--	--	--	--
Soft hardwoods ^{4/}									
Central States ^{5/}	11,986	7,040	5,672	6,810	31,508	--	--	--	31,508
Exported ^{3/}	7,171	--	--	3,336	10,507	--	--	--	--
Total	19,157	7,040	5,672	10,146	42,015	--	--	--	31,508
Hard hardwoods ^{6/}									
Central States ^{5/}	3,226	6,915	2,066	384	12,591	--	--	--	12,591
Exported ^{3/}	13,741	15,195	--	4,832	33,768	--	--	--	--
Total	16,967	22,110	2,066	5,216	46,359	--	--	--	12,591
Total roundwood									
Central States ^{5/}	15,212	13,955	7,738	7,194	44,099	--	--	--	44,099
Exported ^{3/}	31,403	15,195	--	8,632	55,230	--	--	--	--
Total	46,615	29,150	7,738	15,826	99,329	--	--	--	44,099
Residue, softwoods									
Exported ^{3/}	--	123	--	3,285	3,408	--	--	--	--
Total	--	123	--	3,285	3,408	--	--	--	--
Residue, hardwoods									
Central States ^{5/}	22,041	41,720	6,454	9,974	80,189	4,318	--	4,318	84,507
Exported ^{3/}	12,055	86,126	--	58,203	156,384	--	2,432	2,432	--
Total	34,096	127,846	6,454	68,177	236,573	4,318	2,432	6,750	84,507
All wood material									
Central States ^{5/}	37,253	55,675	14,192	17,168	124,288	4,318	--	4,318	128,606
Exported ^{3/}	43,458	101,444	--	70,120	215,022	--	2,432	2,432	--
Total	80,711	157,119	14,192	87,288	339,310	4,318	2,432	6,750	128,606

1/ Factors used in converting to standard green cords (128 cu. ft. including bark and air space) were:

- 4,266 pounds of softwood roundwood;
- 4,795 pounds of soft hardwood roundwood;
- 5,394 pounds of hard hardwood roundwood;
- 4,100 pounds of softwood chips (green mill residue);
- 4,400 pounds of hardwood chips (green mill residue);
- 2,500 pounds of chips (all species, dry mill residue).

2/ Vertical columns of figures under box heading "Production by States" present the amount of pulpwood cut in each State.

3/ Pulpwood shipped to mills outside the region.

4/ Hardwood species with an average specific gravity of 0.50 or less.

5/ Combined to prevent disclosure of individual mill receipts.

6/ Hardwood species with an average specific gravity greater than 0.50.

Table 5.- Average daily production of active woodpulp mills in the Central States by mill, location, and type of pulp produced, 1991

(In tons per 24 hours) 1/

State and Company	Location	All types	Type of pulp			
			Sulfite	Kraft	Groundwood and other mechanical	Semi-chemical
Illinois						
(No current operations)						
Total	0 mill	--	--	--	--	--
Indiana						
Weston Paper and Mfg. Co.	Terre Haute	300	--	--	--	300
Total	1 mill	300	--	--	--	300
Iowa						
Consolidated Packaging Corp	Fort Madison	150	--	--	--	150
Total	1 mill	150	--	--	--	150
Missouri						
Huebert Fibreboard, Inc.	Booneville	60	--	--	60	--
Total	1 mill	60	--	--	60	--
All States	3 mills	510	--	--	60	450

1/ Lockwood's Directory of the Paper and Allied Industries—1991.

Table 6.- -Lake States pulpwood production by State of origin and destination, 1987-1991

(In thousand stand cords, unpeeled)1/

MICHIGAN

Year	Total production	Destination of pulpwood			
		Minnesota	Wisconsin	Michigan	Other
1987	2,747	--	313	2,420	14
1988	2,920	(2/)	311	2,597	12
1989	3,112	(2/)	319	2,777	16
1990	2,982	1	313	2,645	23
1991	3,016	5	304	2,687	20
5-year average	2,955	1	312	2,625	17

MINNESOTA

Year	Total production	Destination of pulpwood			
		Minnesota	Wisconsin	Michigan	Other
1987	2,079	1,967	61	--	51
1988	2,131	2,002	79	2	48
1989	2,263	2,110	116	2	34
1990	2,361	2,200	127	1	33
1991	2,391	2,269	101	--	21
5-year average	2,245	2,110	97	1	37

WISCONSIN

Year	Total production	Destination of pulpwood			
		Minnesota	Wisconsin	Michigan	Other
1987	2,869	62	2,644	161	2
1988	3,084	80	2,771	233	(2/)
1989	3,161	89	2,799	272	1
1990	3,094	83	2,768	243	--
1991	3,146	69	2,799	274	4
5-year average	3,071	77	2,756	237	1

1/ Includes mill residues used for pulp.

2/ Less than 500 cords.

Table 7.--Lake States pulpwood production by Forest Survey Unit and destination by State, 1991

(In thousand standard cords, unpeeled)

MICHIGAN

Unit	Total production	Destination of pulpwood			
		Michigan	Minnesota	Wisconsin	Other
Roundwood					
Eastern Upper Peninsula	760	674	--	75	11
Western Upper Peninsula	1,045	824	5	209	7
Northern Lower Peninsula	923	921	--	--	2
Southern Lower Peninsula	35	35	--	--	--
Total	2,763	2,454	5	284	20
Residues	253	233	--	19	--
Total pulpwood	3,016	2,687	5	303	20

MINNESOTA

Unit	Total production	Destination of pulpwood			
		Michigan	Minnesota	Wisconsin	Other
Roundwood					
Aspen-Birch	978	--	908	49	21
Northern Pine	1,209	--	1,194	15	--
Central Hardwood	105	--	71	34	--
Prairie	13	--	13	--	--
Total	2,305	--	2,186	98	21
Residues	86	--	84	2	--
Total pulpwood	2,391	--	2,270	100	21

WISCONSIN

Unit	Total production	Destination of pulpwood			
		Michigan	Minnesota	Wisconsin	Other
Roundwood					
Northeast	1,055	220	1	834	--
Northwest	1,097	26	43	1,028	--
Central	550	--	--	550	--
Southwest	63	--	--	63	--
Southeast	20	--	--	20	--
Total	2,785	246	44	2,495	--
Residues	362	28	25	305	4
Total pulpwood	3,147	274	69	2,800	4

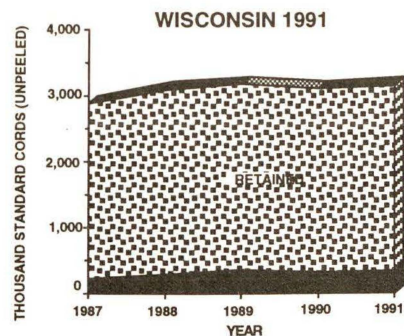
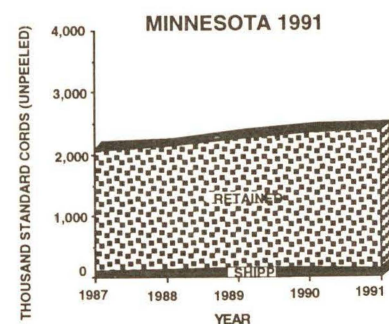
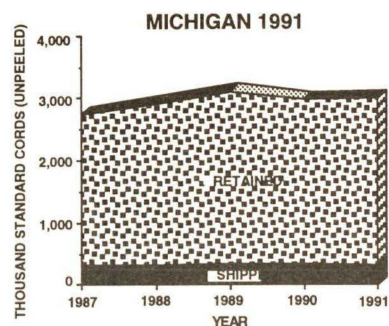


Table 8.- -Lake States annual pulpwood production from roundwood by species, State, and Forest Survey Unit, 1987-1991

(In thousand standard cords, unpeeled)

MICHIGAN

Unit	All species1/					Pine					Spruce				
	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Eastern Upper Peninsula	711	758	768	747	760	95	93	53	99	109	54	53	66	29	22
Western Upper Peninsula	777	911	1,044	989	1,045	58	82	70	87	88	41	39	48	36	40
Northern Lower Peninsula	978	946	986	935	923	139	123	131	113	112	2	1	1	1	1
Southern Lower Peninsula	52	59	54	46	35	(2/)	(2/)	(2/)	(2/)	(2/)	--	--	--	--	--
Total	2,518	2,674	2,852	2,717	2,763	292	298	254	299	309	97	93	115	66	63

MINNESOTA

Aspen-Birch	969	922	986	1,014	979	64	72	66	58	55	82	114	130	137	110
Northern Pine	911	997	1,106	1,152	1,209	45	47	63	76	98	19	32	33	43	31
Central Hardwood	83	94	89	106	106	2	2	3	4	10	(2/)	(2/)	(2/)	(2/)	(2/)
Prairie	1	4	3	4	12	--	--	(2/)	(2/)	--	--	--	--	--	--
Total	1,964	2,017	2,184	2,276	2,306	111	121	132	138	163	101	146	163	180	141

WISCONSIN

Northeast	1,044	1,112	1,090	1,075	1,055	139	170	149	152	145	24	26	27	32	17
Northwest	977	1,078	1,139	1,127	1,097	80	114	120	162	211	11	15	16	15	15
Central	513	552	586	595	549	239	250	246	262	277	1	2	2	1	1
Southwest	26	32	38	53	63	23	28	25	34	50	(2/)	(2/)	(2/)	(2/)	(2/)
Southeast	12	20	16	16	20	7	12	10	10	13	(2/)	(2/)	(2/)	(2/)	(2/)
Total	2,572	2,794	2,869	2,866	2,784	488	574	550	620	696	36	43	45	48	33
Total Lake States	7,054	7,485	7,905	7,859	7,853	891	993	936	1,057	1,168	234	282	323	294	237

1/ Includes a small quantity of cedar not shown elsewhere in the table.

2/ Less than 500 cords.

(Table 8 continued on next page)

(Table 8 continued)

MICHIGAN															
Unit	Balsam fir					Hemlock					Tamarack				
	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Eastern Upper Peninsula	57	75	88	51	63	20	20	23	31	28	2	3	4	5	5
Western Upper Peninsula	38	39	51	33	37	19	15	19	24	20	20	2	2	3	4
Northern Lower Peninsula	3	4	4	2	3	--	(2/)	(2/)	1	(2/)	--	--	--	--	--
Southern Lower Peninsula	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	98	118	143	86	103	39	35	42	56	48	22	5	6	8	9

MINNESOTA															
Aspen-Birch	61	102	118	117	106	--	--	--	--	--	5	9	2	2	3
Northern Pine	50	68	80	80	90	--	--	--	--	--	3	2	3	2	1
Central Hardwood	1	1	1	(2/)	(2/)	--	--	--	--	--	--	--	--	--	(2/)
Prairie	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	112	171	199	197	196	--	--	--	--	--	8	11	5	4	4

WISCONSIN															
Northeast	32	39	38	37	31	40	40	36	32	26	1	1	2	4	3
Northwest	12	31	28	27	33	1	4	5	4	5	1	2	2	4	3
Central	1	1	1	1	(2/)	1	2	2	2	2	(2/)	1	1	1	(2/)
Southwest	(2/)	(2/)	--	(2/)	--	--	(2/)	--	(2/)	--	--	--	--	--	--
Southeast	--	(2/)	--	(2/)	(2/)	--	(2/)	--	(2/)	(2/)	--	--	--	--	--
Total	45	71	67	66	64	42	46	43	38	33	2	4	5	9	6
Total Lake States	255	360	409	349	363	81	81	85	94	81	32	20	16	21	19

2/ Less than 500 cords.

(Table 8 continued on next page)

(Table 8 continued)

MICHIGAN															
Unit	Aspen					Birch					Other hardwoods				
	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Eastern Upper Peninsula	114	135	171	220	210	87	106	107	82	66	251	253	233	226	257
Western Upper Peninsula	180	293	364	369	368	106	115	120	103	82	300	316	357	333	406
Northern Lower Peninsula	593	562	553	515	510	35	38	52	43	41	206	218	245	259	256
Southern Lower Peninsula	10	19	16	12	6	(2/)	(2/)	(2/)	(2/)	(2/)	42	40	38	34	29
Total	897	1,009	1,104	1,116	1,094	228	259	279	228	189	799	827	873	852	948

MINNESOTA															
Aspen-Birch	716	581	616	632	643	12	10	21	21	10	29	34	34	44	52
Northern Pine	784	830	909	928	959	1	2	2	1	2	9	16	17	22	28
Central Hardwood	77	86	81	94	84	(2/)	1	1	1	1	3	4	4	7	11
Prairie	1	4	3	4	12	--	--	--	--	--	--	--	--	--	--
Total	1,578	1,501	1,609	1,658	1,698	13	13	24	23	13	41	54	55	73	91

WISCONSIN															
Northeast	369	418	437	409	414	145	151	146	136	137	294	267	254	272	282
Northwest	572	573	573	520	513	122	139	151	149	107	178	200	243	246	210
Central	153	176	184	151	149	19	23	35	45	27	99	97	113	134	93
Southwest	2	3	12	14	11	(2/)	(2/)	1	1	1	1	1	1	4	1
Southeast	1	1	2	2	3	1	1	(2/)	(2/)	(2/)	3	6	4	3	4
Total	1,097	1,171	1,208	1,096	1,090	287	314	333	331	272	575	571	615	659	590
Total Lake States	3,572	3,681	3,921	3,870	3,882	528	586	636	582	474	1,415	1,452	1,543	1,584	1,629

2/Less than 500 cords.

Table 9.--Pulpwood production from roundwood by unit, county and species group, Michigan, 1991

(In standard cords, unpeeled)

Unit and county 1/	Species group										
	All species	Balsam Cedar	Balsam fir	Hemlock	Jack pine	Red pine	White pine	Spruce	Tamarack	Ash	Balsam poplar
E. UPPER PENINSULA											
Alger	123,123	749	9,365	5,160	7,004	3,695	1,103	1,854	768	1,604	26,387
Chippewa	78,235	480	6,095	2,933	11,602	2,078	869	2,920	412	443	25,621
Delta	161,754	1,008	13,085	5,532	22,391	5,283	1,483	2,979	1,032	1,239	48,480
Luce	53,516	366	4,871	2,014	8,819	1,940	645	1,844	375	391	10,810
Mackinac	90,581	487	6,609	2,699	5,703	3,158	1,404	3,876	421	727	26,570
Menominee	139,956	625	9,966	3,873	7,856	3,425	920	5,102	781	1,161	47,662
Schoolcraft	112,457	994	12,899	5,341	13,000	5,121	1,462	3,765	1,108	1,116	23,995
Total	759,622	4,709	62,890	27,552	76,375	24,700	7,886	22,340	4,897	6,681	209,525
W. UPPER PENINSULA											
Baraga	61,216	116	1,598	1,655	1,159	614	170	782	118	533	23,295
Dickinson	155,757	687	9,399	3,730	12,960	3,770	1,010	5,420	928	864	68,853
Gogebic	96,718	10	1,637	582	2,067	462	14	1,460	79	1,412	25,132
Houghton	102,934	99	2,066	2,576	5,276	1,704	228	3,070	201	1,463	23,260
Iron	159,739	216	6,110	1,535	2,683	1,525	368	12,617	631	1,248	57,468
Keweenaw	10,961	--	14	--	1,706	1,180	--	194	--	83	1,831
Marquette	306,470	1,247	16,238	9,585	40,730	7,502	1,952	15,442	1,694	2,401	89,333
Ontonagon	151,697	--	367	165	467	333	--	1,179	--	5,391	78,360
Total	1,045,492	2,375	37,429	19,828	67,048	17,090	3,742	40,164	3,651	13,395	367,532
N. LOWER PENINSULA											
Alcona	49,695	--	31	--	5,441	184	54	--	--	621	31,230
Alpena	26,362	--	151	--	512	96	--	25	--	455	18,044
Antrim	11,614	--	--	--	41	190	--	--	--	79	7,369
Arenac	10,311	--	--	--	104	84	--	--	--	206	6,137
Bay	42	--	--	--	16	--	--	--	--	--	26
Benzie	20,631	--	--	--	45	126	--	--	--	313	10,679
Charlevoix	2,546	14	109	1	16	16	--	27	--	6	1,204
Cheboygan	56,510	113	1,157	11	3,395	1,139	1,463	320	--	124	35,306
Clare	42,568	--	--	--	2,116	26	11	--	--	78	31,079
Crawford	58,903	--	--	--	24,792	1,881	189	--	--	65	17,668
Emmet	12,629	--	--	--	1,866	1,060	19	--	--	76	5,121
Gladwin	14,383	--	--	--	11	--	--	--	--	83	11,914
Grand Traverse	12,056	--	--	--	67	940	--	--	--	58	8,513
Iosco	11,965	--	--	--	751	772	--	--	--	211	7,565
Isabella	11,698	--	--	--	18	--	--	--	--	51	10,409
Kalkaska	31,154	--	--	--	6,694	1,544	14	--	--	47	11,591
Lake	64,635	--	--	--	5,021	486	--	--	--	521	30,006
Leelanau	3,109	--	--	--	--	--	--	--	--	--	125
Manistee	44,757	--	--	--	353	638	--	--	--	473	21,673
Mason	35,310	--	--	--	203	62	--	--	--	159	20,971
Mecosta	25,983	--	--	--	158	153	--	--	--	548	15,908
Midland	26,587	--	--	--	98	94	--	--	--	151	22,383
Missaukee	42,870	--	--	--	706	1,485	--	--	--	233	29,537
Montmorency	39,572	--	--	--	3,744	222	27	--	--	628	22,027
Newaygo	26,585	--	--	--	451	120	--	--	--	151	16,129
Oceana	16,346	--	--	--	--	--	--	--	--	98	8,608
Ogemaw	16,261	--	--	--	2,014	30	--	--	--	207	9,863
Osceola	31,157	--	--	--	83	266	--	--	--	491	21,369
Oscoda	37,751	--	--	--	12,776	1,381	94	--	--	362	15,067
Otsego	39,123	1	14	--	4,808	2,220	40	116	--	510	11,926
Presque Isle	43,803	46	1,299	4	3,462	322	21	687	--	1,049	23,755
Roscommon	29,616	42	329	4	9,634	187	19	80	--	117	14,327
Wexford	26,476	--	--	--	2,065	3,362	--	--	--	175	12,478
Total	923,008	216	3,090	20	91,461	19,086	1,951	1,255	--	8,346	510,007
S. LOWER PENINSULA											
Allegan	10,471	--	--	--	--	--	--	--	--	--	1,189
Barry	988	--	--	--	--	--	--	--	--	9	397
Cass	496	--	--	--	--	--	--	--	--	--	--
Gratiot	331	--	--	--	--	--	--	--	--	--	--
Kalamazoo	116	--	--	--	--	--	--	--	--	2	233
Kent	322	--	--	--	--	--	--	--	--	--	--
Montcalm	4,145	--	--	--	64	--	--	--	--	--	184
Muskegon	10,230	--	--	--	--	--	--	--	--	6	2,184
Ottawa	2,777	--	--	--	--	--	--	--	--	68	1,735
St. Joseph	2,355	--	--	--	--	--	--	--	--	1	131
Van Buren	2,912	--	--	--	--	--	--	--	--	--	--
Total	35,143	--	--	--	64	--	--	--	--	86	6,053
State total	2,763,265	7,300	103,409	47,400	234,948	60,876	13,579	63,759	8,548	28,508	1,093,117

1/ Includes only those counties that supplied pulpwood in 1991.

(Table 9 continued on next page)

(Table 9 continued)

Unit and county 1/	MICHIGAN											
	Species group											
	Bass-wood	Beech	White birch	Yellow birch	Cotton-wood	Elm	Hickory	Hard maple	Soft maple	Red oak	White oak	Other hardwoods
E. UPPER PENINSULA												
Alger	2,238	2,561	5,327	2,123	--	332	--	28,098	17,023	1,583	2	2,115
Chippewa	734	618	3,468	436	--	57	--	5,782	7,846	373	--	393
Delta	1,744	1,859	14,148	1,821	--	233	--	19,130	12,205	1,132	2	1,626
Luce	542	678	4,198	440	--	92	--	7,986	4,572	426	--	521
Mackinac	1,075	1,102	6,886	933	--	128	--	11,111	8,924	843	--	864
Menominee	1,424	1,613	18,330	1,433	--	210	--	18,133	11,256	1,003	5	1,341
Schoolcraft	1,552	1,651	4,482	1,613	--	207	--	17,018	10,929	1,006	2	1,442
Total	9,309	10,082	56,839	8,799	--	1,259	--	107,258	72,755	6,366	11	8,302
W. UPPER PENINSULA												
Baraga	773	663	2,892	1,600	--	91	--	15,024	6,684	683	1	684
Dickinson	1,182	1,331	14,452	1,160	--	232	--	14,424	8,862	820	149	1,113
Gogebic	2,049	2,020	2,227	1,863	--	302	--	33,650	16,665	2,126	42	1,676
Houghton	1,779	1,581	6,056	2,621	--	227	--	30,608	14,268	1,537	42	1,402
Iron	1,549	2,067	12,024	1,997	--	296	--	32,834	16,341	1,730	21	1,691
Keweenaw	111	168	504	228	--	24	--	3,141	1,452	138	--	140
Marquette	3,283	3,834	24,725	3,127	--	506	--	43,620	25,868	2,429	21	3,129
Ontonagon	7,295	689	4,173	2,570	--	100	--	31,096	11,302	2,584	7	526
Total	18,021	12,353	67,053	15,166	--	1,778	--	204,397	101,442	12,047	283	10,361
N. LOWER PENINSULA												
Alcona	145	112	4,490	--	--	--	--	351	3,979	1,962	121	--
Alpena	90	89	2,303	2	--	--	--	301	3,594	85	10	3
Antrim	143	149	705	1	--	--	--	429	2,507	--	--	1
Arenac	21	28	1,223	16	--	--	--	101	1,383	351	395	20
Bay	--	--	--	--	--	--	--	--	--	--	--	--
Benzie	938	565	311	69	--	--	--	1,768	4,604	577	157	479
Charlevoix	24	12	439	--	--	--	--	83	595	--	--	--
Cheboygan	410	199	3,497	--	--	--	--	1,353	6,787	921	4	--
Clare	--	153	555	38	--	--	--	628	4,706	1,952	767	459
Crawford	205	156	1,665	2	--	--	--	897	4,887	6,229	264	3
Emmet	143	91	996	--	--	--	--	499	2,737	21	--	--
Gladwin	--	4	395	5	--	--	--	19	1,123	469	355	5
Grand Traverse	104	105	340	1	--	--	--	435	641	428	216	208
Iosco	21	25	929	7	--	--	--	80	1,019	406	57	7
Isabella	--	47	53	34	--	--	--	219	722	56	30	59
Kalkaska	12	51	457	55	--	--	--	4,805	3,354	1,354	1,071	105
Lake	544	594	639	173	--	--	--	3,068	6,784	9,255	6,727	817
Leelanau	563	521	26	52	--	--	--	521	521	416	312	52
Manistee	1,355	1,335	753	164	--	--	--	3,477	5,926	3,445	3,281	1,884
Mason	401	534	530	13	--	--	--	1,321	3,378	3,402	3,289	1,047
Mecosta	--	17	482	52	--	--	--	467	2,171	4,136	1,676	215
Midland	--	83	788	37	--	--	--	203	1,684	629	382	55
Missaukee	427	11	404	5	--	--	--	179	6,856	1,543	1,268	216
Montmorency	187	153	3,649	--	--	--	--	648	5,393	2,531	89	--
Newaygo	--	117	216	72	--	--	--	432	1,690	2,906	4,213	88
Oceana	--	51	91	32	--	--	--	149	606	3,357	3,304	50
Ogemaw	6	35	1,400	10	--	--	--	129	1,986	454	33	10
Osceola	208	260	792	129	--	--	--	2,068	2,901	1,684	681	225
Oscoda	64	14	2,080	--	--	--	--	189	2,666	2,272	386	--
Otsego	668	708	2,732	2	--	--	--	4,743	10,591	40	--	4
Presque Isle	173	178	5,452	--	--	--	--	520	5,469	546	45	--
Roscommon	19	23	827	2	--	--	--	75	2,180	1,051	655	2
Wexford	922	451	223	116	--	--	--	687	3,181	1,730	560	526
Total	7,793	6,871	39,442	1,089	--	--	--	30,844	106,621	54,208	30,348	6,540
S. LOWER PENINSULA												
Allegan	--	--	--	--	--	--	--	--	2,828	3,101	3,353	--
Barry	--	5	1	1	--	--	--	27	193	191	163	1
Cass	--	--	--	--	--	--	--	--	178	150	168	--
Gratiot	--	5	3	3	--	--	--	22	57	--	--	6
Kalamazoo	--	--	--	--	--	--	--	--	41	34	41	--
Kent	--	--	--	--	--	--	--	--	--	104	34	--
Montcalm	--	6	4	4	--	--	--	26	74	889	881	7
Muskegon	--	65	10	9	--	--	--	40	512	4,055	3,729	7
Ottawa	--	2	--	--	--	--	--	1	414	1,072	1,156	--
St. Joseph	--	--	--	--	--	--	--	--	846	714	795	--
Van Buren	--	--	--	--	--	--	--	--	1,046	883	983	--
Total	--	83	18	17	--	--	--	116	6,189	11,193	11,303	21
State total	35,123	29,389	163,352	25,071	--	3,037	--	342,615	287,007	83,814	41,945	25,224

1/ Includes only those counties that supplied pulpwood in 1991.

Table 10.--Pulpwood production from roundwood by county and species group, Minnesota, 1991

(In standard cords, unpeeled)

Unit and county 1/	Species group											
	All species	Cedar	Balsam fir	Hemlock	Jack pine	Red pine	White pine	Spruce	Tamarack	Ash	Aspen	Balsam poplar
ASPEN-BIRCH												
Carlton	42,990	--	11,144	--	3,844	2,741	--	2,457	21	--	13,962	3,622
Cook	44,112	--	6,182	--	--	5	--	7,394	10	--	30,388	133
Koochiching	312,694	--	23,305	--	6,878	655	9	42,194	1,864	--	220,858	16,931
Lake	83,424	--	10,174	--	2,445	129	11	12,110	83	--	55,066	979
St. Louis	495,529	--	55,598	--	35,129	2,786	177	45,457	892	--	322,772	23,526
Total	978,749	--	106,403	--	48,296	6,316	197	109,612	2,870	--	643,046	45,191
NORTHERN PINE												
Aitkin	85,822	--	5,786	--	599	245	--	940	20	--	66,361	8,491
Becker	81,175	--	747	--	696	99	4	14	--	--	79,212	403
Beltrami	177,158	--	12,782	--	11,474	3,186	20	3,882	117	--	143,530	2,167
Cass	187,224	--	6,765	--	11,614	1,631	20	1,694	164	--	164,021	1,161
Clearwater	65,990	--	2,287	--	2,611	1,823	9	498	--	--	57,350	1,412
Crow Wing	66,092	--	350	--	3,239	810	--	33	102	--	61,258	300
Hubbard	83,173	--	521	--	6,242	688	27	138	--	--	75,178	379
Itasca	364,276	--	58,555	--	11,752	630	47	20,614	281	--	261,540	4,294
Lake of the Woods	41,969	--	2,370	--	19,959	86	1	1,961	--	--	17,310	282
Mahnomen	19,404	--	--	--	--	--	--	--	--	--	19,309	95
Roseau	22,145	--	57	--	16,227	18	--	746	--	--	4,838	259
Wadena	14,610	--	--	--	4,084	589	7	--	--	--	8,697	71
Total	1,209,038	--	90,220	--	88,497	9,805	135	30,520	684	--	958,604	19,314
CENTRAL HARDWOOD												
Chisago	57	--	--	--	--	--	--	--	--	--	57	--
Isanti	12	--	--	--	--	--	--	--	--	--	12	--
Kanabec	8,761	--	--	--	--	--	--	--	--	--	8,761	--
Mille Lacs	27,998	--	39	--	1,150	1,096	1,099	--	--	--	24,604	10
Morrison	3,055	--	--	--	72	18	--	181	--	--	2,779	5
Otter Tail	2,688	--	--	--	82	25	1	--	--	--	2,556	24
Pine	60,152	--	86	--	3,751	871	--	428	14	--	44,142	4,939
Sherburne	2,031	--	--	--	105	1,926	--	--	--	--	--	--
Todd	792	--	--	--	72	18	--	--	--	--	697	5
Total	105,546	--	125	--	5,232	3,954	1,100	609	14	--	83,608	4,983
PRAIRIE												
Marshall	1,635	--	--	--	--	--	--	--	--	--	1,635	--
Norman	156	--	--	--	--	--	--	--	--	--	156	--
Pennington	1,302	--	--	--	--	--	--	--	--	--	1,302	--
Polk	2,125	--	--	--	--	--	--	--	--	--	2,125	--
Red Lake	7,281	--	--	--	--	--	--	--	--	--	7,257	24
Total	12,499	--	--	--	--	--	--	--	--	--	12,475	24
State total	2,305,832	--	196,748	--	142,025	20,075	1,432	140,741	3,568	--	1,697,733	69,512

1/ Includes only those counties that supplied pulpwood in 1991.

(Table 10 continued on next page)

(Table 10 continued)

MINNESOTA

Unit and county 1/	Bass- wood	Beech	White birch	Yellow birch	Cotton- wood	Elm	Hickory	Hard maple	Soft maple	Red oak	White oak	Other hardwoods
ASPEN-BIRCH												
Carlton	--	--	3,445	--	--	--	--	--	1,754	--	--	--
Cook	--	--	0	--	--	--	--	--	--	--	--	--
Koochiching	--	--	0	--	--	--	--	--	--	--	--	--
Lake	--	--	2,427	--	--	--	--	--	--	--	--	--
St. Louis	--	--	4,093	--	--	--	--	28	5,071	--	--	--
Total	--	--	9,965	--	--	--	--	28	6,825	--	--	--
NORTHERN PINE												
Aitkin	--	--	--	--	--	--	--	--	3,380	--	--	--
Becker	--	--	--	--	--	--	--	--	--	--	--	--
Beltrami	--	--	--	--	--	--	--	--	--	--	--	--
Cass	--	--	154	--	--	--	--	--	--	--	--	--
Clearwater	--	--	--	--	--	--	--	--	--	--	--	--
Crow Wing	--	--	--	--	--	--	--	--	--	--	--	--
Hubbard	--	--	--	--	--	--	--	--	--	--	--	--
Itasca	--	--	1,075	--	--	--	--	--	5,488	--	--	--
Lake of the Woods	--	--	--	--	--	--	--	--	--	--	--	--
Mahnomen	--	--	--	--	--	--	--	--	--	--	--	--
Roseau	--	--	--	--	--	--	--	--	--	--	--	--
Wadena	--	--	1,162	--	--	--	--	--	--	--	--	--
Total	--	--	2,391	--	--	--	--	--	8,868	--	--	--
CENTRAL HARDWOOD												
Chisago	--	--	--	--	--	--	--	--	--	--	--	--
Isanti	--	--	--	--	--	--	--	--	--	--	--	--
Kanabec	--	--	--	--	--	--	--	--	--	--	--	--
Mille Lacs	--	--	--	--	--	--	--	--	--	--	--	--
Morrison	--	--	--	--	--	--	--	--	--	--	--	--
Otter Tail	--	--	--	--	--	--	--	--	--	--	--	--
Pine	--	--	1,167	--	--	--	--	--	4,754	--	--	--
Sherburne	--	--	--	--	--	--	--	--	--	--	--	--
Todd	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	1,167	--	--	--	--	--	4,754	--	--	--
PRAIRIE												
Marshall	--	--	--	--	--	--	--	--	--	--	--	--
Norman	--	--	--	--	--	--	--	--	--	--	--	--
Pennington	--	--	--	--	--	--	--	--	--	--	--	--
Polk	--	--	--	--	--	--	--	--	--	--	--	--
Red Lake	--	--	--	--	--	--	--	--	--	--	--	--
Total	--	--	--	--	--	--	--	--	--	--	--	--
State total	--	--	13,523	--	--	--	--	28	20,447	--	--	--

1/ Includes only those counties that supplied pulpwood in 1991.

Table 11.--Pulpwood production from roundwood county and species group, Wisconsin, 1991

(In standard cords, unpeeled)

Unit and county 1/	Species group										
	All species	Balsam Cedar	Balsam fir	Hemlock	Jack pine	Red pine	White pine	Spruce	Tamarack	Ash	Balsam poplar
NORTHEASTERN											
Florence	87,384	34	3,700	2,933	2,428	2,286	242	1,517	108	1,062	35,196
Forest	117,025	--	5,086	1,591	4,170	3,941	197	3,573	376	4,177	39,892
Langlade	102,382	--	4,876	1,543	2,204	2,488	103	1,133	166	3,327	52,404
Lincoln	103,739	--	2,809	680	3,726	4,088	243	705	261	4,082	48,585
Marinette	167,223	22	3,862	840	26,492	16,231	821	1,972	545	1,457	67,728
Menominee	52,413	41	603	15,615	1,981	1,307	2,623	81	42	1,119	15,402
Oconto	74,775	--	496	169	5,801	12,052	307	221	--	596	32,220
Oneida	178,692	--	6,320	829	12,843	12,403	1,599	4,662	1,143	5,606	59,730
Shawano	21,784	--	140	1,278	256	3,191	152	137	--	720	6,457
Vilas	149,638	--	3,353	333	12,614	6,804	1,126	2,649	54	2,318	56,734
Total	1,055,055	97	31,245	25,811	72,515	64,791	7,413	16,650	2,695	24,464	414,348
NORTHWESTERN											
Ashland	85,733	--	5,189	181	11,771	3,059	--	3,967	341	3,062	29,575
Barron	23,406	--	23	22	1,366	1,029	--	108	--	401	14,959
Bayfield	192,585	--	1,597	65	38,780	25,353	142	1,125	71	1,318	90,162
Burnett	62,908	--	48	--	21,666	6,517	--	22	--	280	30,129
Douglas	113,325	--	7,839	--	32,499	10,376	--	1,527	71	212	41,607
Iron	120,621	244	7,167	2,136	3,554	2,211	565	2,616	539	2,922	60,508
Polk	17,498	--	18	55	3,702	845	--	138	--	160	11,660
Price	112,854	--	5,219	1,016	3,872	4,112	495	2,302	879	3,771	51,662
Rusk	79,151	--	177	241	1,000	1,533	13	579	876	3,772	32,543
Sawyer	131,543	--	2,291	257	3,235	6,369	211	1,369	328	5,150	67,208
Taylor	75,774	--	2,641	1,255	338	819	64	575	152	2,859	38,991
Washburn	81,307	--	343	--	14,046	10,349	748	179	59	1,749	44,056
Total	1,096,705	244	32,552	5,228	135,829	72,572	2,238	14,507	3,316	25,656	513,060
CENTRAL											
Adams	77,290	--	--	--	34,618	31,486	2,255	13	--	371	1,828
Chippewa	45,928	--	73	83	1,009	1,528	64	33	80	1,433	28,198
Clark	80,148	--	25	10	3,511	4,064	207	10	89	3,113	41,635
Eau Claire	30,633	--	--	--	5,205	5,991	129	--	--	744	11,072
Jackson	77,278	--	--	--	34,469	12,481	1,158	99	36	1,170	13,376
Juneau	37,569	--	7	--	18,851	12,655	823	--	--	385	543
Marathon	61,834	--	296	839	2,062	7,295	326	206	--	1,733	30,548
Marquette	11,882	--	--	--	2,563	7,094	980	13	10	124	22
Monroe	25,039	--	--	--	8,355	11,545	525	147	13	400	1,044
Portage	26,561	--	36	637	5,202	9,953	1,844	86	31	411	4,345
Waupaca	23,870	--	15	190	1,757	10,388	1,215	--	10	299	6,568
Waushara	24,778	--	14	--	4,005	17,886	1,499	55	--	78	427
Wood	26,885	--	--	3	3,977	6,350	1,234	64	14	522	9,144
Total	549,695	--	466	1,762	125,584	138,716	12,259	726	283	10,783	148,750
SOUTHWESTERN											
Buffalo	3,776	--	--	--	348	2,375	934	119	--	--	--
Crawford	67	--	--	--	46	21	--	--	--	--	--
Dunn	21,587	--	--	--	5,207	7,980	312	30	--	185	6,289
Grant	1,219	--	--	--	107	1,092	6	14	--	--	--
Iowa	910	--	--	--	135	630	145	--	--	--	--
La Crosse	4,337	--	--	--	691	3,357	7	13	--	25	--
Papin	1,081	--	--	--	48	108	102	--	--	--	823
Pierce	114	--	--	--	35	36	--	13	--	1	20
Richland	1,828	--	--	--	122	1,699	7	--	--	--	--
St. Croix	10,113	--	--	--	580	5,944	6	25	--	--	3,333
Sauk	7,837	--	--	--	1,713	5,509	324	30	--	13	108
Trempealeau	9,814	--	--	--	973	8,675	--	147	--	--	19
Vernon	491	--	--	--	--	441	--	50	--	--	--
Total	63,174	--	--	--	10,005	37,867	1,843	441	--	224	10,592
SOUTHEASTERN											
Brown	1,101	--	--	--	38	379	--	--	--	11	556
Calumet	16	--	--	--	--	--	16	--	--	--	--
Columbia	6,331	--	--	--	795	4,257	206	70	--	58	315
Dane	825	--	--	--	69	282	344	--	--	14	--
Dodge	10	--	--	--	6	4	--	--	--	--	--
Door	136	--	--	--	--	--	--	--	--	2	88
Fond Du Lac	431	--	--	--	--	142	--	157	--	7	--
Green	525	--	--	--	230	252	--	--	--	4	--
Green Lake	4,125	--	--	--	42	2,478	1,010	--	--	50	108
Jefferson	141	--	14	--	--	119	--	--	--	--	--
Kewaunee	65	--	--	--	--	13	--	--	--	4	--
Manitowoc	472	--	--	80	29	72	19	--	--	27	--
Milwaukee	22	--	--	--	--	22	--	--	--	--	--
Outagamie	2,987	--	--	--	--	80	40	--	--	71	2,047
Ozaukee	36	--	--	--	16	20	--	--	--	--	--
Rock	503	--	--	--	290	201	--	--	--	1	--
Walworth	291	--	--	--	--	195	96	--	--	--	--
Washington	315	--	--	--	--	191	124	--	--	--	--
Waukesha	1,163	--	--	--	38	913	212	--	--	--	--
Winnebago	60	--	--	14	--	11	--	--	--	2	11
Total	19,555	--	14	94	1,553	9,631	2,067	227	--	251	3,125
State total	2,784,184	341	64,277	32,895	345,486	323,577	25,820	32,551	6,294	61,378	1,089,875

1/ includes only those counties that supplied pulpwood in 1991.

(Table 11 continued on next page)

(Table 11 continued)

(Table 11 continued)		WISCONSIN										
		Species group										
Unit and county 1/	Bass-wood	Beech	White birch	Yellow birch	Cotton-wood	Elm	Hickory	Hard maple	Soft maple	Red oak	White oak	Other hardwoods
NORTHEASTERN												
Florence	1,254	799	13,014	489	--	144	--	12,599	7,227	816	172	563
Forest	1,779	338	16,190	1,412	--	1,800	--	15,834	11,597	2,599	1,462	392
Langlade	2,410	137	5,552	991	--	2,120	--	10,107	8,020	2,319	898	471
Lincoln	4,513	87	7,424	658	--	2,596	--	9,734	7,137	4,490	335	1,586
Marinette	985	838	13,790	859	--	154	--	14,530	10,450	2,765	1,478	754
Menominee	99	116	2,087	593	--	383	--	5,137	4,644	216	93	94
Oconto	525	548	6,896	301	--	90	--	8,302	4,789	641	187	386
Oneida	5,432	372	25,945	915	--	647	--	18,364	11,646	6,015	1,175	1,933
Shawano	208	41	1,500	340	--	98	--	3,028	3,024	699	419	96
Vilas	3,727	394	37,167	547	--	668	--	10,597	6,436	2,204	420	789
Total	20,932	3,670	129,565	7,105	--	8,700	--	108,232	74,970	22,764	6,639	7,064
NORTHWESTERN												
Ashland	1,069	65	7,354	730	--	804	--	8,900	6,156	2,176	956	378
Barron	127	1	2,930	68	--	80	--	1,075	730	329	57	101
Bayfield	360	1	19,860	471	--	173	--	4,218	7,102	1,160	334	293
Burnett	16	--	2,054	74	--	7	--	947	896	74	51	127
Douglas	26	--	10,095	54	--	13	--	771	8,017	127	88	3
Iron	3,562	455	7,650	690	--	284	--	13,479	7,669	2,789	567	952
Polk	8	--	249	17	--	4	--	361	213	40	27	1
Price	3,968	43	11,103	694	--	1,521	--	9,223	7,231	3,880	618	1,245
Rusk	1,960	14	10,381	807	--	586	--	11,267	7,863	3,613	760	1,166
Sawyer	2,216	8	16,155	1,487	--	1,169	--	11,467	8,005	2,929	858	831
Taylor	1,795	130	5,325	892	--	3,998	--	7,203	6,333	1,642	311	451
Washburn	114	--	4,777	97	--	287	--	1,865	2,108	364	43	123
Total	15,221	717	97,933	6,081	--	8,926	--	70,776	62,323	19,123	4,670	5,671
CENTRAL												
Adams	392	--	852	79	--	18	--	1,110	705	3,039	473	51
Chippewa	953	7	3,314	114	--	212	--	3,549	2,509	1,935	132	702
Clark	766	11	7,481	666	--	675	--	7,622	7,092	1,875	970	326
Eau Claire	150	5	2,105	168	--	278	--	1,982	1,884	539	249	132
Jackson	282	2	3,706	294	--	190	--	3,439	4,852	1,027	619	78
Juneau	48	--	906	98	--	22	--	1,451	1,256	314	203	7
Marathon	1,178	35	2,420	474	--	1,106	--	6,814	3,938	1,641	563	360
Marquette	16	--	289	32	--	14	--	355	249	70	49	2
Monroe	29	--	948	59	--	47	--	770	842	171	108	36
Portage	314	2	784	96	--	90	--	1,211	948	361	150	60
Waupaca	10	--	274	147	--	6	--	1,181	1,315	283	189	23
Waushara	8	--	157	24	--	3	--	234	189	125	71	3
Wood	134	1	1,008	121	--	86	--	1,348	1,999	539	300	41
Total	4,280	63	24,244	2,372	--	2,747	--	31,066	27,778	11,919	4,076	1,821
SOUTHWESTERN												
Buffalo	--	--	--	--	--	--	--	--	--	--	--	--
Crawford	--	--	--	--	--	--	--	--	--	--	--	--
Dunn	43	--	402	32	--	7	--	514	325	169	52	40
Grant	--	--	--	--	--	--	--	--	--	--	--	--
Iowa	--	--	--	--	--	--	--	--	--	--	--	--
La Crosse	3	--	54	6	--	1	--	72	58	35	15	--
Pepin	--	--	--	--	--	--	--	--	--	--	--	--
Pierce	--	--	3	--	--	--	--	3	2	1	--	--
Richland	--	--	--	--	--	--	--	--	--	--	--	--
St. Croix	--	--	150	--	--	--	--	44	31	--	--	--
Sauk	2	--	29	3	--	1	--	51	42	7	5	--
Trempealeau	--	--	--	--	--	--	--	--	--	--	--	--
Vernon	--	--	--	--	--	--	--	--	--	--	--	--
Total	48	--	638	41	--	9	--	684	458	212	72	40
SOUTHEASTERN												
Brown	--	--	5	6	--	--	--	45	51	6	4	--
Calumet	--	--	--	--	--	--	--	--	--	--	--	--
Columbia	5	--	106	21	--	2	--	174	176	83	56	7
Dane	1	--	30	3	--	1	--	37	28	9	7	--
Dodge	--	--	--	--	--	--	--	--	--	--	--	--
Door	--	--	--	2	--	--	--	9	17	11	7	--
Fond Du Lac	--	--	--	5	--	--	--	24	45	29	20	2
Green	1	--	10	1	--	--	--	14	9	2	2	--
Green Lake	6	--	117	14	--	3	--	142	101	31	22	1
Jefferson	--	--	--	--	--	--	--	2	3	2	1	--
Kewaunee	--	--	1	2	--	--	--	14	19	7	5	--
Manitowoc	--	--	14	14	--	--	--	109	108	--	--	--
Milwaukee	--	--	--	--	--	--	--	--	--	--	--	--
Outagamie	3	--	71	33	--	1	--	254	272	67	44	4
Ozaukee	--	--	--	--	--	--	--	--	--	--	--	--
Rock	--	--	3	--	--	--	--	4	2	1	1	--
Walworth	--	--	--	--	--	--	--	--	--	--	--	--
Washington	--	--	--	--	--	--	--	--	--	--	--	--
Waukesha	--	--	--	--	--	--	--	--	--	--	--	--
Winnebago	--	--	3	--	--	--	--	6	6	4	3	--
Total	16	--	360	101	--	7	--	834	837	252	172	14
State total	40,497	4,450	252,740	15,700	--	20,389	--	211,592	166,366	54,270	15,629	14,610

1/ Includes only those counties that supplied pulpwood in 1991.

Table 12.--Central States pulpwood production by State and destination, 1987-1991

(In thousand standard cords, unpeeled)

Year	Illinois			Indiana			Iowa			Missouri		
	Destination			Destination			Destination			Destination		
	Total	Central	Other	Total	Central	Other	Total	Central	Other	Total	Central	Other
		States	States		States	States		States	States		States	States
1987	91	35	56	178	76	102	23	23	--	111	29	82
1988	92	38	55	179	73	106	26	26	--	101	24	77
1989	92	32	60	170	68	102	25	25	--	109	18	91
1990	76	33	43	189	75	114	14	14	--	95	19	76
1991	81	37	44	157	56	101	14	14	--	87	17	70

Table 13.- Trends in receipts of roundwood and residue as pulpwood,
Central States, 1987-1991

(In thousand standard cords, unpeeled)

Type of material and area	1987	1988	1989	1990	1991
Roundwood					
Illinois	—	—	—	—	—
Indiana, Iowa, Missouri	67	62	53	44	44
Total	67	62	53	44	44
Residue					
Illinois	—	—	—	—	—
Indiana, Iowa, Missouri	98	99	91	97	85
Total	98	99	91	97	85
All material	165	161	144	141	129



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Lake States pulpwood production increased to 8.6 million cords. Central States pulpwood production dropped about 9 percent from 374 thousand cords in 1990 to 339 thousand cords in 1991. Pulpwood production is shown by county and species group for Michigan, Minnesota, Wisconsin, Iowa, Missouri, Illinois, and Indiana.

KEY WORDS: Roundwood, whole-tree-chips, residue, Minnesota, Michigan, Wisconsin, Illinois, Iowa, Indiana, Missouri.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.

